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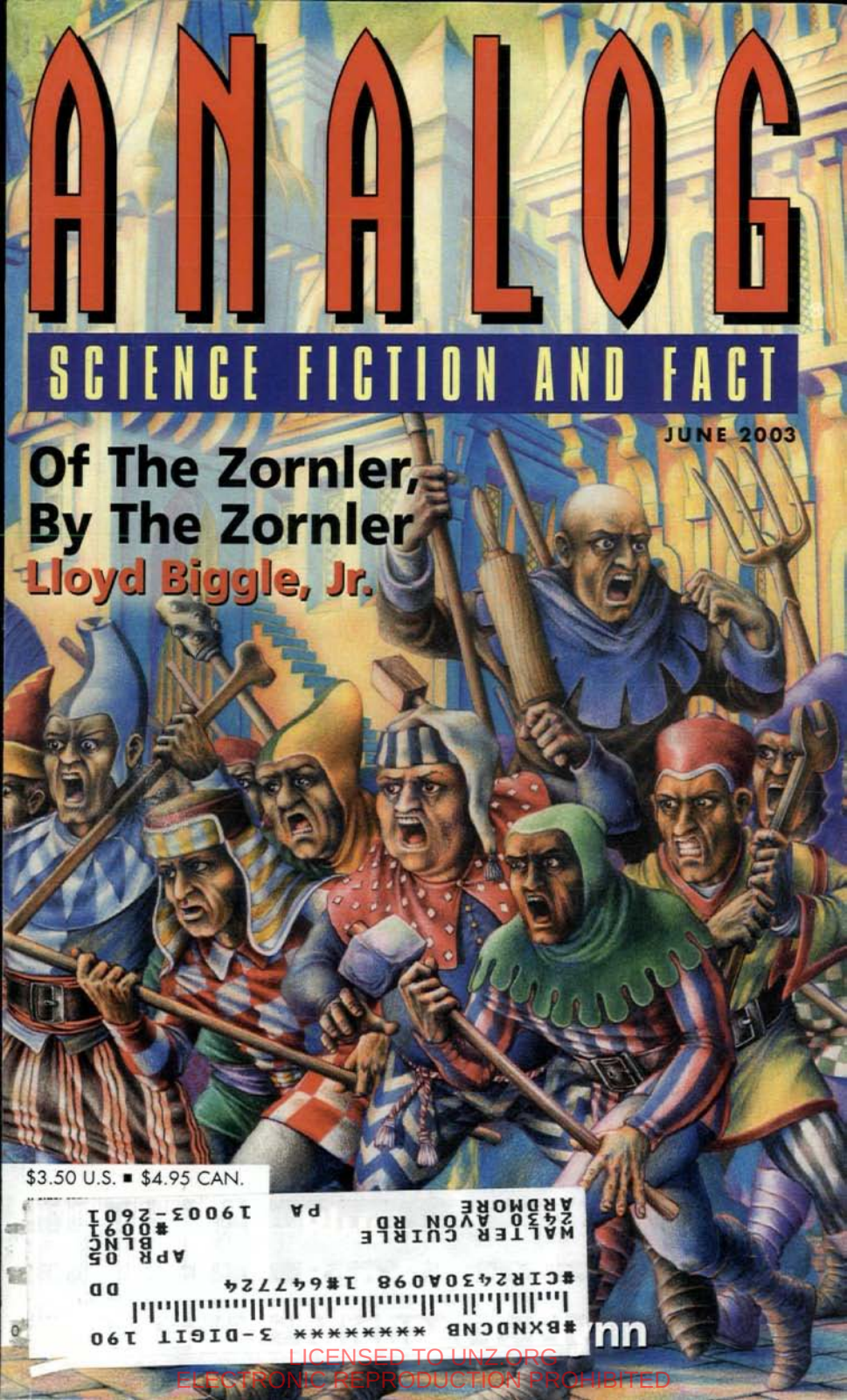
SCIENCE FICTION AND FACT

JUNE 2003

Of The Zornler, By The Zornler

Lloyd Biggle, Jr.



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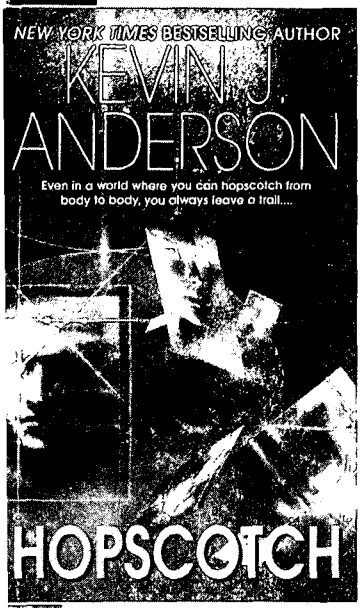
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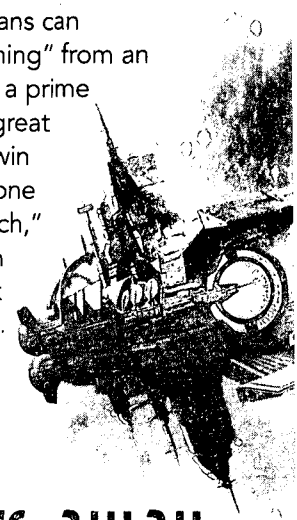

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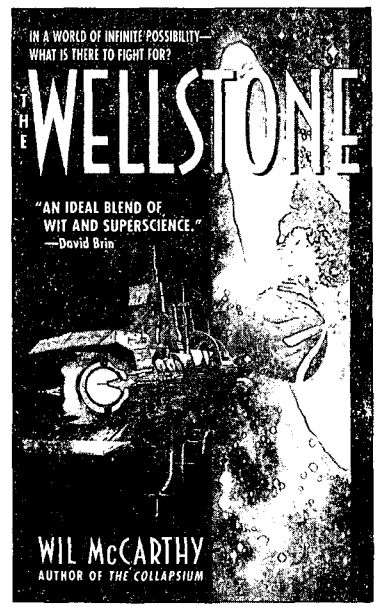
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SCIENCE FICTION AND FACT

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June 3, 2003

42

114

NOVELETTES

OF THE ZORNLER, BY THE ZORNLER . . . , Lloyd Biggle, Jr. ____ 10
THE POWER OF VISIONS, Charles E. Gannon ____ 42
BY THE RULES, Edward M. Lerner ____ 100
SAM AND THE FLYING DUTCHMAN, Ben Bova ____ 114

SHORT STORIES

WORKING ALONE, Henry Melton ____ 62
3RD CORINTHIANS, Michael F. Flynn ____ 73
PUNCTUATED EQUILIBRIUM, Pete D. Manison ____ 86
ALOHA, Ken Wharton ____ 92

SCIENCE FACT

PERSONALIZED DRUGS, Kyle Kirkland ____ 30

PROBABILITY ZERO

THE WORD MILL, Don D'Ammassa ____ 84

READER'S DEPARTMENTS

THE EDITOR'S PAGE ____ 4
BIOLOG: KYLE KIRKLAND, Jay Kay Klein ____ 40
IN TIMES TO COME ____ 60
THE ALTERNATE VIEW, Jeffery D. Kooistra ____ 80
THE REFERENCE LIBRARY, Tom Easton ____ 134
BRASS TACKS ____ 140
UPCOMING EVENTS, Anthony Lewis ____ 144

Stanley Schmidt Editor — **Trevor Quachri** Associate Editor

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Indicia on Page 5 — Online Chat Listing on Page 83

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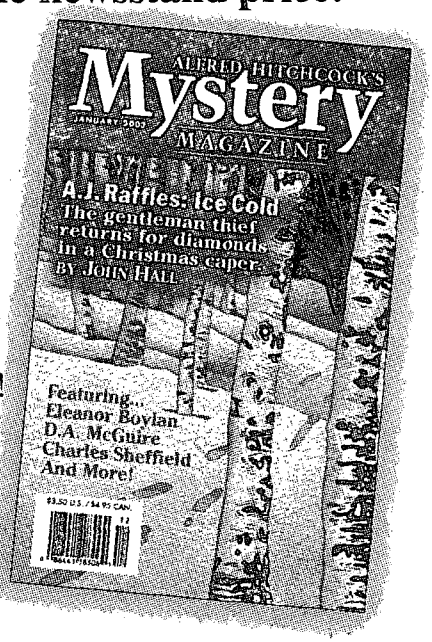

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EDITORIAL Stanley Schmidt

A TIME TO BE WRONG

On several occasions I've complained about a recent fad viewing the cultivation of "self-esteem" as a primary goal of education. The most important thing, we've been encouraged to believe, is that students should be made to feel good about themselves—whether they deserve to or not. Correcting their errors, or insisting that they correct them, does not make them feel good; therefore they should be spared such treatment by their teachers. The tangible results include such things as an epidemic of people who use and omit punctuation more or less at random, thereby destroying its function as a tool for precise communication.

With that said, I would like to turn now to another educational problem I've observed, which may at first appear to contradict that one. It may be that in at least some cases problem "A," just described, arose as a well-intentioned but misguided reaction to problem "B": a constant emphasis on evaluation that makes students afraid to take chances for fear they will be "marked wrong."

Now, at some point in the educational process—typically at the end of a block of material—there does need to be some form of evaluation. You can't claim to have taught something until the students demonstrate that they've learned it. If they haven't, you need to try again until they do.

But that's at the end, when you would like to believe you've finished a unit. The problem I'm referring to is that so much of our education, at least when it's not obsessed with Self-Esteem at All Costs, has long tended to make students feel that they're *always* on trial. Teachers' deeds, if not words, say that the ultimate goal of education is not wisdom, but good grades—and that means that even when teachers say they encourage class discussion, anything wrong that you say in class will be held against you. So unless you're really sure you're right, it's best not to say anything at all. Most teachers probably don't mean to give this impression, but it happens anyway, and it's educationally counterproductive. At the moment, this tendency may be getting worse, as the pendulum swings away from self-esteem toward a primary emphasis on doing well on disproportionately important standardized tests.

I was recently reminded of all this when I was asked to give an open (but for some students required) lecture and visit a couple of classes at the college where I used to teach regularly. The audiences, in all cases consisting at least mostly of students, seemed generally attentive, but reluctant to open their mouths when I tried to engage them in dialog instead of just talking at them. This was in marked contrast to other talks I'd recently given at science fiction conventions, where audiences tend to be very active and vocal indeed—which just may have something to do with the fact that they're not being graded on anything they say or do there.

I do not suggest or imply that any par-

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ticular professors at the college I visited had made their students afraid to participate, much less that they had done so deliberately. The problem is more a pervasive climate, likely to be found in almost any school, that leads students to come into any new class or lecture warily, not opening up until whoever is in the front of the room earns their trust. I remember seeing the same thing when I was a professor myself. Usually I *could* earn enough of their trust to stir up some lively discussion, but seldom immediately.

Sometimes, particularly with a captive audience like premeds who had to take physics but didn't want to, or music majors taking the acoustics course I concocted specifically to give them a relatively painless and useful way to satisfy their basic science requirement, it took weeks to loosen things up to my satisfaction. When I taught science fiction, one of the three main elements of the course was classroom discussion that was supposed to be wide-ranging and freewheeling. To encourage that, I started by scrambling the desks and sitting in one of them myself so that there was no "person in the front of the room." But I still found that it worked best if I had one two-hour session rather than two one-hour sessions per week. Why? Because it took the first hour to get the students warmed up and loosened up enough to do what I wanted—but once it happened, it sometimes got so good that they wouldn't let me go home when class was supposed to be over.

Ironically, the fear of being wrong is likely to be worst for some of the students who find the material easiest. They tend to have more active self-critical faculties as well, and in many educational systems they're likely to have had too little *practice* at being wrong. I remember being taught from a very early age that it was important to do as well as possible in school, and it seemed an obvious corollary that I should try hard not to make mistakes—because mistakes were "bad." The home environment I grew up in, through a fortunate accident of birth, gave me a good head start on school, and I found the first few grades almost ridiculously easy.

I made so few mistakes on homework or tests—not because of any special virtues of mine, but simply because I wasn't being given challenging material—that when I did get things wrong, I found the experience far more disturbing than it should have been. When I finally hit courses hard enough that I had to struggle with them, I sometimes wondered whether I was getting stupid in my old age. It would have been better if I'd been exposed to harder stuff from the start, and encouraged to feel—to really believe, at all levels—that there was nothing wrong with making mistakes or asking "stupid questions" while you're learning. If those things don't happen, it's probably because you're not really

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learning anything new, and I now think that's where I was in the early grades.

The particular variation on the theme that I experienced may be peculiar to students who are made to sit through easy courses when they're ready for harder ones, but the general stigmatization of wrongness is pervasive. A common, dramatic example is the frequently dismal performance of Americans in learning or using foreign languages. The typical American teaching environment has the effect, in most cases probably unintended, of making language students afraid to open their mouths in the classes where they should be practicing conversation, for fear they'll say something wrong and it will hurt their grade. Well, of course they'll make mistakes! So what? That's how you learn to speak a language: by trying to speak it, having your mistakes corrected—preferably in a way that doesn't feel like personal criticism—and trying again and again till the mistakes gradually become fewer. The most successful attempt I've seen to create that feeling was an "immersion" course in which the professor entered the classroom, immediately began speaking Polish and kept leading conversational attempts, with zero use of English, for fifteen hours of a weekend. It was surprisingly effective, perhaps because the students simply didn't have time to worry about whether they were saying ridiculous things—as, of course, we all sometimes did (and we all lived to tell the tale).

A fifteen-hour immersion course did not create a roomful of fluent speakers and writers, of course. Anyone who wanted that would have had to go on to considerably more formal study, and eventually be able to demonstrate proficiency in all the intricate details of Polish grammar. But the brief immersion course did an excellent job of overcoming the initial fears of those intricacies, and making students willing to try to speak rather than holding back because making a mistake seemed catastrophic.

Both types of problems—students who never develop basic competence because they're taught that mistakes don't matter, and those who are reluctant to try things because they think mistakes matter too much—are exacerbated by "heterogeneous grouping," another educational fad holding that students of all abilities and backgrounds should be thrown together in the same classes. Students who are in over their

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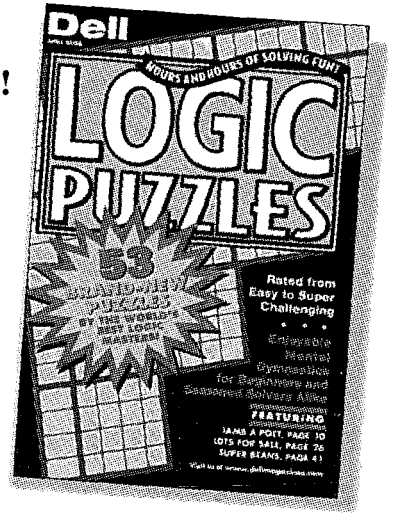

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heads won't survive unless many of their mistakes are overlooked. Those who are placed in too low a class will be unchallenged and unprepared when they finally get in a situation where they're faced with something they do find difficult.

What we need, I think, is two things:

(1) Forget homogenization. Put students in classes where they're challenged, with challenges they can overcome—but not too easily. This means, like it or not, different classes for different students.

(2) Get away from the silly extremes of acting as if mistakes don't matter, or as if they matter more than they really do. Explicitly recognize that there are times when it's okay to be wrong, and times when it isn't. In general, being wrong (sometimes) is to be expected and should be accepted calmly in a safe learning situation. In a classroom, for instance, when no test is being given, students should have the feeling that they can speak freely and that any mistakes they make will be corrected, but not penalized—that correction is offered not as a personal judgment or to reduce their grade, but simply to help them learn not to make the same mistake later.

That process, of course, should be used to progress to a state of competence where few mistakes will be made. Sometimes mistakes do matter, very much—when you're flying a plane, for example, or playing a concert, or writing a job application. But mistakes are a perfectly normal part of preparing to do those things. As John W. Campbell liked to say, "Behold the tortoise: He maketh no progress unless he sticketh out his neck." Both students and teachers need to be comfortable with that, and fully aware of the difference between times when mistakes are bad, and when they're not. ■

Your politicians are only as good as their advisors.

—George Sirk

Ten persons who speak make more noise than ten thousand who are silent.

—Napoleon Bonaparte

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CHARLES SHEFFIELD, 1935-2002

Charles Sheffield died of brain cancer on November 2, 2002, in Silver Spring, Maryland. Born in England, he was educated at St. John's College and Cambridge, with advanced degrees in mathematics and theoretical physics. He lived for many years in the United States and served as president of the American Astronautical Society and the Science Fiction Writers of America, and was vice-president of the Earth Satellite Corporation.

He was the author of more than 100 scientific and technical papers and several nonfiction books, as well as numerous novels, novelettes, and short stories. Sheffield the fiction writer often drew on the experience and perspective of Sheffield the scientist, and many of his stories not only make highly imaginative yet rigorous use of scientific material, but also deal realistically with scientists as characters. He was very interested in both scientific and human problems, and both kinds of concerns were prominent in much of his fiction. He began writing science fiction in the late 1970s, quickly achieved prominence as one of its best practitioners in *Analog* and elsewhere, and won both the Nebula and Hugo awards for his 1993 *Analog* novelette "Georgia on My Mind." Those who knew him remember him as a good friend, always a thorough gentleman, with a distinctively impish sense of humor.

He is survived by his wife, writer Nancy Kress, to whom we extend our sincerest condolences.

Stanley Schmidt ■

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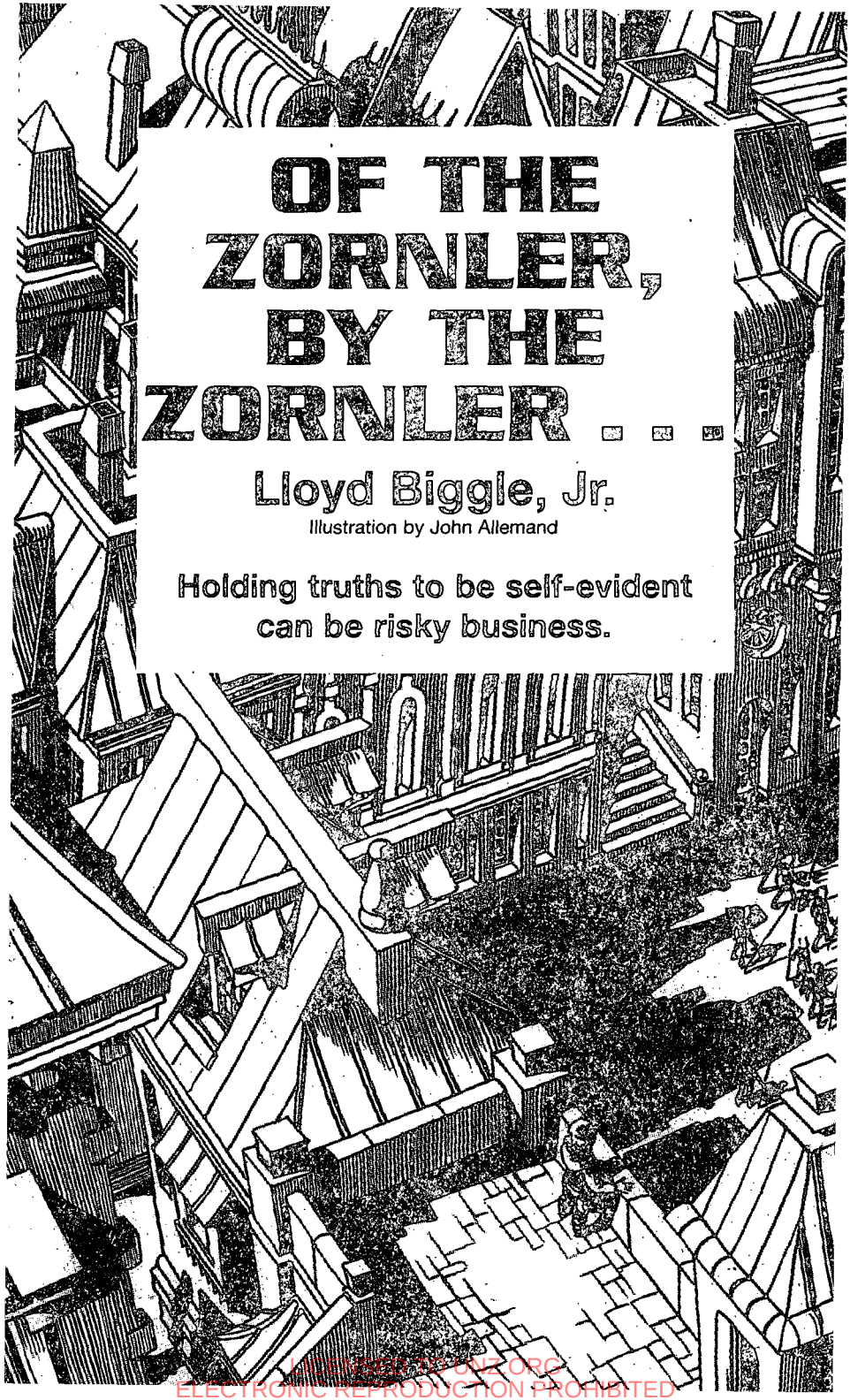

OF THE ZORNLER, BY THE ZORNLER . . .

Lloyd Biggle, Jr.
Illustration by John Allemand

Holding truths to be self-evident can be risky business.

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The world of Zornley presented no special problems for a new and inexperienced coordinator—which was, without a doubt, the reason Howitt Raarn had been assigned there, though it was virtually an insult to call Raarn "inexperienced." He had held every office from novice to assistant coordinator in assignments across the galaxy, performing well and even with occasional flashes of imagination that his superiors termed "brilliant." He was popular with both superiors and subordinates, and he had long been singled-out for higher office. When a suitable world became available, his name headed the list.

He was a balding, huskily-built, pleasant-appearing man. His linguistic skills were legendary in the service, and that fame had preceded him. His first meeting with his staff went well. It marked the beginning of a learning experience for all of them—Raarn had to learn about a totally strange world, and the staff had to begin noting the eccentricities of a new coordinator. Every coordinator had at least a few.

When Raarn finally dismissed the meeting, he sat for a time gazing at the large window that filled one wall of his office. It looked out on the spectacular beauty of Zornley's most inaccessible mountain range. The Interplanetary Relations Bureau had its own eccentricities, and one of them was to locate its principal base on each world where no native could possibly stumble onto it, even accidentally. Raarn had no objections. In the long run, beauty would be less wearisome than ugliness.

He ran his eye over the jagged peaks once more and finally turned away with a sigh. His gaze next fell on a framed motto that—by regulation—hung on the wall in every room of every IPR Headquarters in the galaxy: "Democracy Imposed From Without is the Severest Form of Tyranny." Raarn probably had seen it seven or eight thousand times and even paused to reread it and reflect on it several hundred. Now he reflected on it again and with puzzlement.

"I wonder if it's ever been tried," he mused. He continued to stare at it. Finally he turned to the computer on his desk and evoked a page of quotations:

"Democracy is, by the nature of it, a self-canceling business; and gives in the long run a net result of zero." He thought about that for a long time before he tried another. "Democracy means simply the bludgeoning of the people by the people for the people."

He tried again: "Democracy is only an experiment in government, and it has the obvious disadvantage of merely counting votes instead of weighing them." He spent some time meditating the differences between counting and weighing votes. Finally he spoke into his desk's communicator.

A long twenty minutes later, Rhys Hulme, the base's elderly archivist, limped into his office. Hulme had been eligible for retirement years before, but the IPR Bureau was his life, he did his job competently, and he possessed even at his advanced age a fantastic memory that occasionally made him invaluable. He stood before Raarn's desk squinting near-sightedly at him.

"Sit down, sit down," Raarn said impatiently, indicating a chair. "I've just had a spasm of curiosity. See that motto opposite my desk?"

Hulme squinted at it; returned his squint to Raarn. This time there was an expression of deep puzzlement on his face.

"I suddenly found myself wondering," Raarn said. "Has it ever been tried?"

". . . ever been . . ."

"I mean—has anyone ever tried imposing democracy from without just to see what would happen?"

Hulme relaxed. "That's been done hundreds if not thousands of times. A conqueror always thinks his own customs and institutions are best, and he imposes them on the conquered. No doubt an especially severe form of tyranny has

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sometimes resulted. Maybe it always results. I don't recall any studies . . ."

"It just occurred to me that Zornley might be an excellent world to try such an experiment on. Is there enough money in the budget to buy one of those petty kingdoms?"

"Not my department," Hulme murmured.

"To be sure. Thanks for the information."

Hulme went out and quietly spread the word: The eccentricities this new coordinator had were lulus.

Raarn returned his attention to the computer and began administering a crash course in Zornley political science to himself. Zornley was a patchwork of small political entities. On other worlds, these abbreviated political units would have been miniature baronies or dukedoms, or something comparable. On Zornley, the smallest were called narms, each with a ruler called a narmlich, who owed his allegiance to the ruler of the nearest cynarm, a somewhat larger political entity. The ruler of a cynarm, called a cynlich, owed his allegiance to the nearest postlich, who ruled a postarm, a still larger political entity comparable perhaps to a miniature kingdom. In this land of primitive communications and bad roads, a ruler had genuine difficulty in governing his territory if it got very large, which certainly had contributed to the fact that these political entities were so tiny—or seemed so to an outsider.

Those located on rivers or oceans, where they could make use of water transportation, had an enormous advantage. Zornley's engineers had not yet thought of canals, and somewhere in Raarn's files were minutes of an acrimonious debate as to whether the IPR Bureau should invent them and save the world centuries of floundering with bad communications and terrible transport. The suggestion had got entangled in the red tape of IPR regulations and was overwhelmingly voted down. The IPR Bureau was understandably cautious about opening Pandora's Box.

In the relations between these primitive states, a cynlich could lord it over a narmlich but had to watch his step with a postlich. No doubt postlichs had their own status arrangements in their dealings with each other.

It all seemed highly complicated, but it worked. War was non-existent. If a postlich started throwing too much weight around, a combination of narmlichs and cynlichs quickly emerged to put him in his place. Whatever happened, the commoners paid the price, as they did on every world; but Zornley's commoners were quite well off. Extreme poverty seemed nonexistent.

The goal of the IPR Bureau, to convert all of these petty political entities to democracies—ultimately, to achieve one world-wide democracy—seemed a long, long way off, but Raarn's attention had been caught by a peculiarity that was almost unique to Zornley.

Scattered about the world's three continents were several genuine cities, each of them the capital of one of the few really large kingdoms or postarms. It only followed that these large kingdoms were, all of them, blessed with convenient networks of rivers and an ocean for easy transport and communication. If a petty nobleman—or, more likely, his wife—tired of rusticating amidst farm animals and spinning wheels, he could sell his narm, or his cynarm, or even his postarm, if the price was right, and retire to the bright lights and dazzling society of a major city. The buyer, probably a neighboring narmlich or cynlich or postlich who had managed his territory well, extracted taxes more efficiently than usual from his harassed people, and saved his money, added the new purchase to the land he already held and automatically promoted himself from narmlich to cynlich or even to postlich if the addition were large enough.

Raarn asked himself, "What would be the objection to the IPR Bureau buying a

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small political entity and setting up a model government for it? A democracy, in fact?"

He would have to think this over carefully. If managed properly, he might shorten by decades the time it was going to require to convert Zornley to a world-wide democracy.

He summoned his assistant coordinator. Laing Mares had been doomed from childhood to always be someone's assistant. The best he had ever achieved, in any assignment handed to him, was an undistinguished mediocrity. Now he was serving his time out until retirement and trying to avoid the slightest controversy that might postpone that date.

He had already heard Rhys Hulme's description of the new coordinator's eccentricities, and he responded to Raarn's signal expecting something genuinely weird. Even so, the question Raarn greeted him with astonished him. "Are there any narms up for sale cheap?"

Mares blinked twice before he bleated, "*Narms* for sale?"

"Is there a central real estate market where one looks for narm listings?"

"I don't recall that the problem has ever come up," Mares murmured politely.

He went out muttering to himself. The gossip about the new coordinator's eccentricities was about to take flight.

Raarn thought for a moment and decided he was using the wrong approach. He consulted the base directory, studied a map, and set about solving his problem in his own way.

The walk seemed to take forever, and when he reached his destination, he thought he was lost. The sign over the door said, "Property Control." The interior looked like a rather disorganized warehouse, which it probably was. The manager, whose name was Leslor Ozing, had a harassed look that immediately became more harassed when he learned that the new coordinator was calling. He was young and, according to his personal file, extremely competent. He had acquired an impressive list of commendations. This was his misfortune. He was unlikely to be promoted because he had made himself too valuable where he was.

He said absently, "Yes. Well—welcome to Zornley, I hope. I can't remember the last time any coordinator found his way to this remote outpost. What can I do for you?"

"It occurred to me that the IPR Bureau must own substantial amounts of property scattered all over the planet—houses that our agents can occupy when necessary, businesses we operate more or less permanently, land, anything needed to further our mission here. In fact, we must own something or other in every substantial city on Zornley."

Ozing nodded. "Just about every substantial city and also in a lot of unlikely places. An agent will insist on our acquiring something he needs for some project or other. Maybe whatever it is turns out not to be necessary, or he finishes his mission and moves on, and then we are stuck with another property."

"What happens to it?"

"I try to dispose of it—at a profit, of course."

Raarn, grappling with the realities of an unfamiliar world, wanted to know what sort of thing an agent could need that suddenly became unnecessary or useless.

Ozing went to a filing cabinet. "Here's an example. House. It was available cheap. An agent was keeping an eye on a political agitator who lived next door. We suspected he was planning some kind of uprising. The uprising came to nothing and eventually the agitator moved away. The agent followed him, of course, leaving me stuck with this house. I try not to sell things at a loss—in fact, this department shows a very commendable profit on its operations—but this particular house is too small for even a small family and in a decrepit

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neighborhood. Problem."

"What will you do?" Raarn asked.

"I might send an agent down there to use it to start a new business. Then I could sell the business and make a profit on the house. But these things take time and planning, and it's hard to find a willing agent. They all want to lead a revolution. Establishing a greengrocer business or a new fad in foot wrappings doesn't appeal to them."

"Foot wrappings?"

"A Zornley peculiarity. Shoes consist of a sort of sole to protect the foot with brightly colored or strikingly designed straps threaded through holes. Both men and women are ridiculously vain about their foot wrappings."

Raarn chuckled. At least it wasn't nose rings or elbow ribbons. Fads took strange forms on most planets.

"This world's profile says that from time to time one of these petty rulers will sell his narm, or cynarm, or whatever, and retire to the bright lights of the nearest city," Raarn said. "How difficult is it to acquire one?"

"Acquire a narm? It's not especially difficult. I have one in stock now."

Raarn paused to swallow hard. "You have—do you mean the IPR Bureau actually owns a narm?"

"Right. It was for sale, and I thought I could turn it over at a nice profit, so I bought it."

"What's happened to it? I mean, you can't put a political entity on the shelf until you find a use for it. Surely it has a population, and some measure of trade and industry, and its people have to eat, and work, and carry on their lives."

"Of course. All of that. I sent a bright young agent down there to act as narmlich until I'm able to dispose of the narm at a profit. He's having a ball, and his wife, who of course is his narmlicher, has revolutionized the narm's high society. They'll be reluctant to leave, but I think I'm about to receive an offer that will be too good to turn down."

"An offer? You mean—there's a continuing market in narms?"

"There is for this one. Look." He conjured up a map on his computer. "This we call Narmport to avoid using the native name, which is unpronounceable. Small seaside city on a river. Not much of a port, or a city, either, and a miserable excuse for a river, though a lot could be made of it.

"Despite those things it happens to be an extremely important city. Four narms come together there; and Narmlarnif, which is the one we own, had the luck to include the bit of land that contains the port. The other three narms, which for convenience I call Narm North, Narm East, and Narm South—because those are their locations—have to import everything through Narmport.

"When the old narmlich of Narmlarnif—or, more likely, his wife—decided to sell the narm and retire to the bright lights of what passes for high society, the other three narmlichs immediately began to drool. If one of them acquired Narmlarnif, he could promote himself to cynlich. Also, the ruler who controlled Narmport also controlled customs duties for the entire area; and he could, with adroit manipulations, make a very good thing of that. Fortunately I heard about this in time, and I got there while the bidding was still going on. I swept the board and got the narm. Since then, the three disappointed narmlichs have been hopeful that I'll resell it to one of them, and they're ready to resume the bidding any time I'll let them. I expect to turn a very nice profit indeed."

"Let me get this straight. You were the high bidder, you bought the narm, and the other bidders are still trying to outbid you?

"I wasn't the high bidder. I was the low bidder. But I threw in a house in Parshzor, the city the old narmlich and his wife wanted to retire to. I had been trying to get rid of it for a couple of years. IPR Agents, who often have to come and go secretly, didn't care for its

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conspicuous location, but it was ideal for retired minor nobility with social aspirations. I suggested that the house be taken in part payment for the narm, and, once they had seen the house, the narmlich and his narmlicher couldn't resist my offer. So I got rid of an unwanted house and got a bargain price on the narm. Now all I have to do is sell the narm at a profit, and—" He paused. Raarn was shaking his head gently.

"I think not," Raarn said. "I think this particular narm is just what I'm looking for."

It was not the inconspicuous non-entity of a narm that Raarn had had in mind. It contained a port that served three neighboring narms as well as itself, and it was a fishing as well as a trading center of considerable local importance. However, the IPR Bureau already owned it. It was there and waiting for whatever tests and experiments he felt like inflicting on it. He studied the map delightedly. "When can I have a look at it?"

During the negotiations for the sale of the narm, Ozing had played the role of the cousin of the new narmlich. He introduced himself as a son of an important and wealthy postlich, the new narmlich's uncle, who ruled a large postarm on the far eastern coast. The postlich was buying the narm for his nephew. Ozing had been back several times since the purchase was completed, looking into problems the IPR Agent and his wife were encountering in their roles as narmlich and narmlicher and negotiating with one or the other of the three neighboring narmlichs who were still hopeful of buying the narm. It required no adroitness for Raarn to insert himself into this scenario—he became the wealthy east coast postlich, come to see for himself the narm he had bought.

Raarn gave himself a quick language lesson so he could mimic the accent of that far east coast, took the courses all IPR Agents were required to take before they were approved for field work, learned a stylish way to wrap his feet, and pronounced himself ready for action. The excessively padded garments every well-dressed postlich wore seemed suffocating to him, but otherwise he felt well-prepared.

When they arrived in Narmport, they found the situation worse than expected. Police forces or armies were non-existent in Zornler society. A few palace guards provided security for the entire narm, and the three narmlichs who had unsuccessfully attempted to buy the narm had turned nasty. They were trying to run the new narmlich out of his realm. They sent their riffraff over the borders at night to break windows, trash anything moveable, and even damage real estate. Further, they and their wives had blackballed the new rulers socially and were otherwise making the situation as difficult for them as possible. If they tried to set foot outside their narm, they were received sourly with veiled threats and open insults.

The three unfriendly narmlichs and their wives were actually calling on the new narmlich and narmlicher when Raarn and Ozing arrived, continuing the crude psychological warfare they were engaged in to try and persuade them to sell the narm.

Raarn, as an important postlich from a remote corner of the continent, delightedly met the insults head-on. Since he had no intention of selling the narm, there was no need to treat these uncouth neighbors as anything except what they were. He spoke to Effan Normley, the new narmlich of Narmlarnif, in tones his rude guests could not help overhearing. "The petty nobility in this neighborhood have no manners at all. I fear you will have to cultivate the local postlichs and develop social contacts with people of your own class. We will call on some of them before I return home."

Normley, also making certain he was overheard, said soothingly, "That's all right, Uncle. One can't expect the re-

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finements of society in an out-of-the-way place like this. After all, one doesn't have to associate with boors merely because one lives near them. You will notice that they called on us."

"Uninvited, I presume."

"But certainly! Who would invite the likes of them?"

The notion that these newcomers stood far above them socially hit the insulting narmlichs and narmlichers with devastating impact. They were instantly and completely deflated, and they left quietly.

Having shown the boors to the door and delegated an escort to see them out of the narm, Normley turned his attention to the visiting celebrity, who was eager for a guided tour of this newly acquired IPR Bureau property.

They started with the palace, a lovely structure that was a tribute to the narm's wealth as a trade center. It was ingeniously constructed in a striking architectural style that featured oddly flat arches and dazzlingly colored stones. From there, they followed a narrow, winding street down to the docks. The river was a scummy, slow-moving stream that lapsed into small swamps on either side, almost certainly a periodic source of fever. The docks, on the other hand, though there were no ships being unloaded, were of brick, with wide mooring places for the ponderous sailing ships that carried cargo on Zornley. The docks were in excellent repair. Raarn immediately deduced that they were the one profitable feature the narm had to offer and so were meticulously maintained. The river, however, badly needed dredging in order to produce a flow that would carry Narmport's filth out to sea. Also, if the dredging were continued above the city, the river could be enlarged and deepened there for a new set of docks that would divert the heavy wagons that certainly clogged the city's narrow streets on their way to and from the docks in times of prosperity. In Raarn's eyes, the little city was potentially a gold mine. Money spent in improving its infrastructure would be a sound investment, increasing the narm's value many times when the IPR Bureau decided to sell it.

The city also could be made a far more pleasant place to live, with parks lining the river instead of the fever swamps, and the river's present almost non-existent current improved to wash away the town's filth. Obviously the narmlichs who had owned the narm before the IPR Bureau bought it had not been investing money in the upkeep of anything except the docks.

The absence of shipping puzzled him, and he asked about it.

"This is the slack season for the shipping business," Normley said. "Perishable foodstuffs wait for the autumn. There isn't much cloth available now, that waits for the shearing seasons for the various wool-bearing animals, and finished clothing goods wait for available cloth."

"Interesting," Raarn murmured. "I noticed a number of hefty-looking specimens lolling about. Stevedores out of work?"

"Exactly. The slack season is a long one, which is hard on the dockers. I've been trying to think of some way to help them."

"If someone wanted to stir up trouble, out-of-work dockers could be a focal point," Raarn mused.

"It might seem so, but in actual fact they are law-abiding, good citizens. Surprisingly thrifty—they save what money they can in times of prosperity to sustain them through the slack season. Even so, they have it hard."

Apart from its obvious defects, the city was charming. The old, well-built buildings had a genuine artistic appeal as did the winding, narrow streets. The craftsmen were skilled—the foot wrappings were not only colorful but well-designed and -crafted; the clothing was beautifully made of well-dyed and -woven fabrics; metal work and jewelry

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were genuine works of art; and the handmade furniture was magnificent. They strolled through town until they reached a bakery, which occupied one of the more modern-looking buildings. It was situated on the river bank, and Raarn noted with approval that it could receive shipments of flour and other materials it imported directly from a ship.

It was an excellent bakery, and it filled the entire neighborhood with the fragrances of freshly baked bread and pastries. It was, in actual fact, another IPR Property and had been owned by the Bureau for years—one of the many local businesses it had acquired all across Zornley. Agents ran them and fulfilled their IPR responsibilities at the same time, and in a few years they became local fixtures.

Raarn and his party ordered mugs of *sklo*, a pungent hot drink, along with luscious fruit tarts, and they sat at a table munching these while they managed an occasional few words with Shawn Ely, the baker.

"The other narmlichs are determined to make trouble until you give in to one of them," Ely said to Normley.

"Perhaps we can anticipate them," Raarn said. "I take it that there is no such a thing as a police force in this narm?"

"Nor in any of the narms. It has never been necessary," Normley said. "The palace guard has always been sufficient for the few minor ruckuses a narm has."

"And I suppose you collect a duty or tax on all of the goods passing through the port destined for neighboring narms."

"But of course. It's the narm's main source of revenue."

"So—if the other narms decide to make really serious trouble, it will be probably take the form of disrupting the loading and unloading of ships. You've escaped that only because this is the slack season. They will be primed and waiting when business picks up. Tell me about these unesteemed neighbors of yours."

"Non-entities," Normley said. "Most narmlichs are non-entities. They hold on because they have absolute local power and solidarity. If one of them were threatened, either by a neighboring narm or by an uprising in his own narm, every ruler within a hundred kilometers would come to his support. They all know their turns might come next."

"But what about these three neighbors making trouble for a new narmlich? Surely that should be considered unlawful."

"Not as long as they use restraint. They won't try anything dramatic like an armed takeover. For one thing, they haven't got any arms. For another, that would bring intervention from far and wide. Every narmlich, cynlich, and postlich in this part of the continent would rally his palace guard and come to the assistance of Narmlarnif. So they will proceed in subtle ways that they think can't be blamed on them—beginning with sending their riffraff over the border at night to commit petty vandalism. Sly is the word for those characters."

"Then we'll have to be slyer," Raarn observed cheerfully.

Raarn, accompanied by his escort, continued his inspection of the city. Evidently summer was a bad season for everything. Raarn paused to talk with a group of dockers who were lolling in the central city square.

"Jobs hard to find?"

A snort was the answer. "There has been exactly one job going in the past six fives. The ship's captain had two hundred applicants to choose from. The job lasted half a day. You might say jobs are hard to find. They're even harder to keep once you find one."

Raarn nodded. He said to Ozing, "There seems to be an empty shop there at the head of the square. Is it to let?"

"Actually, it's ours. Someone's dud, I suspect, though I can't remember how we happened to acquire it. Sometimes

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during the busy season we rent it out for storage."

"But it is ours, and we can take possession of it and use it?"

"Of course."

Raarn went back to the lolling stevedores. "I have jobs for you. They're permanent—no seasonal layoffs. You'll be doing all kinds of work, but you'll also be spending long periods of time with not much to do. Some men would find these jobs boring. Want to give them a try?"

The sturdiest specimen of the group eyed Raarn warily.

"Fellow, I've got five kids who think they should be fed regularly, and I haven't been doing such a good job at it. I'll try anything."

The others murmured agreement.

Raarn told them to follow him and went to inspect the empty building.

He gave special attention to the basement. He issued a few instructions to Normley, who went to engage a crew of masons and iron workers and also to hire some carpenters. He himself took the stevedores he had hired to a tailor and had made for each of them a jaunty beret-type hat and a stylish short cape. A furniture maker departed from his artistic endeavors long enough to fashion some very businesslike truncheons; a carpenter drilled long holes into their bottoms and a metal worker filled them with molten lead.

The first members of Raarn's constabulary were ready for business. He gave Arnt, the sturdy specimen he had engaged first, the title Maj and sent him out to recruit more members.

By evening the force was forty strong, and he had decided to call the members "public defenders." The building he was remodeling, now the municipal building, had an impressive set of stone jail cells in its basement.

The riffraff from neighboring narms crossed the borders again that night, intent on more hell-raising. Maj Arnt and his public defenders took over. One swing of a truncheon, and the offender was hauled off to jail, unconscious.

The next day, Normley invited the three neighboring narmlichs to a meeting to consider an increase in customs duties. As expected, all three were against it.

"I'm sorry about that," Normley told them, "but there is an unwritten law that each narm is responsible for the conduct of its own residents. Your riffraff is totally out of control. It crosses my borders at night and commits serious vandalism. For that reason, I have had to hire security officers to preserve the peace in my narm, and I will have to compensate citizens who have had property damaged by your citizens' rowdy behavior. All of this is expensive, and since you are not controlling your own riffraff, you will have to pay for the extra expense I incur in controlling it. Therefore, until such time as my borders seem secure again, the import duty on all items destined for your narms is raised from 10 to 25 percent."

All three of them erupted. They argued, they pleaded, they besieged Normley, but when he finally had them escorted out—by several of his new public defenders—the import duty still stood at 25 percent.

"I'm beginning to enjoy this job," Normley said gleefully.

Raarn took the time to launch a few more projects before he returned to his office to catch up on his paperwork—dredging the river, for one. This solved the narm's unemployment problem and was much enjoyed by the workers, who delightedly gamboled in the slow moving, warm water while they scooped accumulated muck and mud from the bottom. The dredgings, dumped along the shore, quickly eliminated the swamps, and when the whole length of the river through the city and beyond had been dredged, Raarn turned the workers to making river walks and parks and brought in masons to construct docks above the city and new roads to reach

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them. In a very short time, the narm was transformed and the Zornlers were congratulating themselves on their far-sighted and imaginative new narmlich. Normley had become quite the most popular ruler the little narm had ever had.

In the meantime, Raarn was meditating his next moves. Under his direction, Effan Normley had made a worthwhile capital investment in the narm of Narmlarnif that would increase the narm's value substantially in the event that they ever decided to dispose of it. Now Raarn could give some attention to his other purpose, using the narm for experiments in democracy.

When he returned to Narmport, his first call was on Ely, the baker. "Has there ever been such a thing as a municipal election?" he asked him.

Ely smoothed his apron over his comfortable paunch. He had the girth of a successful tradesman, especially one who dealt in tempting, high-calorie products. "There hasn't been such a thing on the entire planet," Ely replied. "No citizen of Zornley would have the faintest idea of what you are talking about."

"In other words, government of the people, by the people, and for the people hasn't been thought of yet by anyone."

"You really mean government of the Zornler, by the Zornler, and for the Zornler, and no. You would have a devil of a time explaining what that means to any of our good citizens."

"Democracy," Raarn mused, "is essentially the right to make choices. In a democracy, citizens have a right to choose their government leaders. Citizens of Zornley or any other place shouldn't find that a daunting state of affairs. Why should it be difficult for them to understand? After all, everyone, everywhere, lives by making choices. The customer coming in here for a five-count of tarts has to choose which kinds of fruit he prefers. What's the difference between choosing between a green berry tart and a pulpy apple kind of tart and choosing between one well-known citizen and another for city administrator? The citizens of Zornley ought to take to democracy easily."

Ely was unconvinced. "They don't really chose between two or several kinds of tarts. They just ask for the kind they want. They probably don't even think of it as choosing. And they've never chosen a politician for any kind of office. They wouldn't know how to go about that. So they first would have to learn how to make choices."

"How about an experiment? Surely you've run specials from time to time."

"Never have yet," Ely said complacently.

"Well—try one now. Offer a five-count of tarts in a choice of two flavors for a special price. Impose a limit of five tarts to a customer, and to get the special price the tarts all have to be the same kind. Five green berry tarts or five pulpy apple tarts."

Ely started to protest; Raarn silenced him. "It's an experiment in democracy—democracy imposed from without. We are forcing them to make a choice. They can elect the green berry tarts or the pulpy apple tarts."

"That's an awfully complicated special," Ely protested. "I don't think I can explain all that on a sign."

"Try," Raarn said firmly.

Ely did. He set out a tasteful-looking tray of green berry tarts and another of pulpy apple tarts with the sign announcing the special: five of one or five of the other for only ten whits—the basic coin in local use.

Eight customers came and went; then another four. All paused to study the special offer. All turned away indifferently. Ely reduced the price to eight whits; then to six. "That's so cheap it's ridiculous," he said. "They'll think there's something wrong with the tarts. Raarn gave up on the tarts. "I'll have to think of something else," he said. "Do you make

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just the one kind of bread?"

"It's been standard in Narmport for years."

"There are interesting-looking vegetables for sale in the market. Do they have anything like onions or garlic?"

"They do. They're very good—strong but deliciously flavored."

"Couldn't you make an onion or garlic bread?"

"I could, but no one would buy it."

"Experiment until you can bake a loaf that's really good. Then make several dozen miniature loaves."

"They won't sell."

"You're not going to sell them. You're going to give them away. As free samples."

Raarn was back the following morning. He ate the first miniature loaf of onion bread himself. It was delicious. Ely, doubtful but fully aware that the Coordinator himself had ordered it, turned out several trays of miniature loaves. Thereafter, as long as they lasted, he presented a miniature loaf to every customer who bought a loaf of standard bread. Then he baked several large loaves of onion bread and put them on display in his window.

None of them sold. Customers Raarn asked about the miniature loaves were cautiously approving, but obviously they had no intention of actually buying such a thing. Not when their long-time favorite was available.

"What would happen," Raarn asked Ely, "if you started baking nothing but onion bread?'

"I'd lose all my trade," Ely said.

There were two other bakeries in Narmport, neither of them as popular as Ely's. Raarn agreed that Ely's business was too valuable to the IPR Bureau to be risked with reckless experiments.

He strolled out to the construction site north of the city where new docks were being built and for a time watched the primitive methods that produced sturdy-looking docks in surprisingly short time. While he watched, one of the workers failed to dodge a falling trough of mortar and suffered a broken leg. It happened to be an assistant foreman. He was hauled away for medical attention, and the job's top supervisor, who until that moment had not been in evidence at all and had paid no attention to the actual work going on, ran his eye over the waiting workers and pointed to one, who immediately took over as assistant foreman and got the work going again.

Raarn sought out the supervisor. Since Raarn was known as the wealthy visiting postlich who was paying for the construction, the supervisor gave him his full attention.

"Why did you choose that particular worker?" Raarn asked.

"I liked his looks. All the workers are experienced, probably any of them could handle the job, but one had to be chosen."

"What would happen if the workers were to choose their own assistant foreman?" Raarn asked.

The supervisor shrugged. "They'd go back to work in the same way. What else could happen?"

"I'd like to see it done."

"You want to see the workers chose their own assistant foreman?"

"Yes."

The supervisor's natural reluctance to waste time collided with his respect for a wealthy patron. He halted the work, explained Raarn's request in simple terms, and then returned to the shack that served as his office without another glance. The workers, obviously puzzled, gathered in a circle, discussed this strange problem, and then went back to work. They had chosen the same assistant foreman the supervisor had chosen.

Raarn figuratively returned to the drawing board. He decided to learn more about the Zornler, the natives of Zornley. They were not a sociable people. There were no pubs; no cafes where the natives drank in the company of friends. They were polite to each oth-

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er and to strangers; excessively polite to Raarn, whose clothing told them he was a visiting dignitary. They greeted their narmlich and narmlicher, when they encountered them in the street, with a jerky nod of their heads and came to a respectful halt and waited until they had passed. They seemed to regard them affectionately. The new reign had brought increased prosperity to the little narm as well as fascinating social events.

They were an incredibly honest people. Tax collection, Normley told Raarn, was unbelievably simple. At the beginning of a cycle, or Zornley month, he would announce what the tax would be during the forthcoming month and send a notice to that effect to all shop keepers. They added the tax to everything they sold and dropped the tax money into a collection box as they collected it, bringing it to the palace once a week.

The one quirk was that by some unwritten law, all taxes expired at the end of the month. The tax rate had not changed in anyone's memory, but if the narmlich failed to announce what it was at the beginning of the month, no taxes would be collected until he remedied the oversight.

Customs duties were paid to a customs officer by the wagoners who hauled ships' cargoes to their destinations. They also paid the ships' captains for the merchandise or goods they were picking up.

The Zornler wives did their shopping in the morning at the market that filled the city's central square or throughout the day at small shops that offered every variety of food and merchandise. In the market they paid their taxes themselves, adroitly calculating the percentage of their purchase and dropping coins into the vendor's tax box. The shop keepers collected the tax on their sales.

Life moved tranquilly, leading Raarn to concoct another motto for the IPR Bureau: Contented people do not revolt. But this did not explain their reluctance to make choices in the tests he concocted. He mingled among the shoppers and observed that they readily chose exactly what they wanted when shopping.

He invented another test. He commissioned a furniture maker to build a number of small hanging racks of shelves and paint them in a variety of vivid colors. They provided useful extra storage space; they were colorful and attractive; Narmport had never seen anything like them. As soon as the furniture maker put them on display, they attracted a crowd of interested customers.

The price was modest; the item new and striking; it would enhance any Zornler home, Raarn thought, and also be useful. All a citizen had to do was choose his favorite color.

No one bought.

Raarn continued his experiment. The furniture maker made another batch of racks all painted an unobtrusive shade of light gray. The entire group sold out quickly. This led Raarn to speculate that the citizens of this world might be color blind, but there was no basis for such a conclusion. Cloth for clothing was woven in striking colors and patterns, and the colored patterns on foot wrappings were dazzling.

The citizens did not hesitate to choose a rack if they wanted one—provided that they did not also have to choose a color. It was all highly confusing, and what bearing that might have on their willingness to choose one politician over another escaped him.

He conferred with Effan Normley, the narm's narmlich, and his narmlicher, Vladia. "If you were to hire a public servant to take some of the burden of administration off the narmlich, what would he be?"

"Comptroller," Normley answered promptly. "Counting all those tax whits is more than a drag. It's punishment. Vladia kindly helps me out, but even so, it's a frightful chore, and once they are counted, they have to be counted again into larger denominations so we can pay the palace's bills and meet our payroll. It

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would help if there were such a thing as a bank, but that's wishful thinking for the far future."

"Municipal Comptroller," Raarn mused. "Maybe we could make him also the head of a municipal bank, established to serve both the narm and the public."

Normley shook his head. "My instinct would be to go slowly about that. Since no one on the planet except IPR Personnel has ever heard of a bank, I don't think putting a native in charge of one and telling him to carry on would accomplish anything. If the comptroller could count the tax money, pay bills, and keep account records, that would be a great start. Surely these shop keepers have *some* experience with business records as well as with figuring taxes and counting money. Any of them could do it."

"Right, but let's not forget the most important idea, which is to introduce the concept of a democracy. You'll get your comptroller, but I insist on having him chosen by a free election. It probably would be wise for you to pick two or three of the most likely-seeming candidates yourself. Offer a large enough salary to make the position attractive, something the candidates would really want. Then announce an election and try to teach the citizens what that is and what an election campaign is."

The three of them sat meditating for a time. "I don't see why not," Normley said finally. "The narm certainly needs a comptroller, and if I choose the candidates, we'll get someone capable regardless of who wins. And you'll have had your election, the first in the history of Zornley."

Raarn nodded approvingly. "Let's do it."

The momentous step towards Zornley's first democratic election began with innocent-looking posters plastered about Narmport announcing the position to be filled, the duties, and the annual salary. "Applicants should apply at the palace to the narmlich himself."

There were no applicants, but none were expected. The entire process was too novel for Narmport's citizens to grasp.

The next step consisted of Shawn Ely, the baker, quietly discussing the posters with his tradesmen friends. He pointed out what a fine opportunity the announced position offered. Whoever filled it would be the narm's foremost citizen and stand first at all social and official functions. It was, in fact, the opportunity of a lifetime.

Ely's wife made her own contribution by telling all of her friends about the high social position the new comptroller's wife would assume, automatically—number two in the narm just below the narmlicher.

Farn Distum was Narmport's most successful grocer. He bought the best quality vegetables and fruits in large quantities; extra large quantities if they could be stored over winter. He sold them in quantities ranging from a wagon load to one or two of something for a snack. Those in competition with him had to buy poor quality fruits and vegetables that they could sell cheaply in order to compete. Distum good naturedly let them do this; it spared him the difficulties attendant on handling the poorer grades. He even generously sold his discards to his competitors to be resold.

He was tall and gaunt, but nonetheless jovial. His wrinkled, elderly face was wreathed with one of the odd, circular beards that elderly Zornlers affected. He worked long hours and was kindly, always willing to help one in need. He was more than popular, he was almost venerated. He had built his business with hard work, honest merchandise, and fair pricing.

He was unwilling to leave it or even allow assistants to take over while he assumed a loftier position. Probably it was Mrs. Ely's sly hints about his wife becoming number two on the narm social scale that tipped the balance. Distum's

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wife, Bleddor, nagged him until finally he took the long walk to the palace to find out what this damned election was all about.

Once he found out, he was immediately convinced that all he had to do was announce his candidacy in order to be elected. Who in all of Narmlarnif had a better reputation for honesty, or who could be better trusted with the public money, than he?

Haylor Voine was far younger, and a number of unsavory rumors clung to his business reputation as a wagoner. He hauled goods from ships in the harbor to wherever they were consigned. It was rumored that the weight he delivered often compared unfavorably with the weight he loaded at the ships, and that he forged bills en route so as to collect more from the consignee than he paid.

Actually, this meant little to most of the narm's population, who had few direct contacts with either ships' captains or wagoners. Voine made inquiries, found that the position of Municipal Comptroller would be as important as the posters claimed, and that in addition to a fine salary, handling all the tax money in the narm would give him numerous opportunities to add to his income. He called on the narmlich to announce his own candidacy. Normley saw no convenient way to turn him down. Raarn receive the news with a frown and raised eyebrows. Voine wasn't the sort of candidate he'd had in mind, and he had no confidence in the ability of the Zornlers, in their very first election, to filter out the unsuitable.

But there was a third candidate. Ornon Guntzor was another solid proprietor, a butcher. The narm was pathetically short on sanitation rules, but Guntzor had, on his own initiative, built his slaughterhouse downstream from the city where the pollution would be minimal, with extensive pens and pastures for animals awaiting slaughter. He sold meat retail at his own shop in the city and wholesale in a separate operation directly from the slaughterhouse. He handled most of the wholesale meat business for the entire region, and butchers from all four narms bought meat from him, making his the largest business operation in the area. He imported animals by ship as well as buying them from local farmers, and he did all of that efficiently, competently, and honestly. He drifted into the election in response to Farn Distum's candidacy; his wife suddenly decided she was better qualified to be the number two female in the narm than Bleddor Distum was.

Raarn had his three candidates, the election date was announced, and he briefed Maj Arnt's officers so they could perform the task of explaining to the citizens what an election campaign was and how, on election day, they would select one of the three candidates to be the narm's comptroller.

The candidates themselves had some difficulty in understanding an election campaign. The tradesmen reacted disbelievingly to the notion that they should go around telling their fellow citizens how well qualified they were. Everyone knew them; everyone had done business with them for years.

Raarn decided to get things rolling by announcing a debate. He arranged for free *klono,* a kind of mild beer, for the adults attending and candy for the children. A small platform was erected at one corner of the town's central square.

On a naskler, a free day that occurred each ten days, the square was jammed with adult Zornlers seeking free *klono* and children in pursuit of free candy. Watching the antics of the children, Raarn regretted the candy, but perhaps in many cases the children had brought out the parents.

Farn Distum's speech was a dull paean to himself—how he had worked hard and served the citizens well while building a solid business and reaping deserved profits. The audience listened with respectful boredom.

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As expected, Haylor Voine's speech was far livelier. He promised to safeguard the tax money carefully and keep firm control over how it was spent—the latter of course being completely out of bounds for the position Raarn and Normley had in mind. The narmlich was scowling when he finished, and the audience seemed rather puzzled.

Ornon Guntzor's speech was a replay of Distum's, with different details. The people listened with the same respectful boredom they had shown for Distum. Raarn had expected something like this—after all, these were the first political speeches in the history of Zornley—and he had made arrangements of his own for the rebuttal speeches, which were to follow at once.

Distum drew himself up to his full, pompous height, meditated for a moment, and began to pronounce another paean on the fairness of his business dealings. Maj Arnt himself—he and his public defenders were planted carefully throughout the audience—interrupted with a bellow. "Blow it out, fellow. You know you've been giving short weight for years."

Distum was brought to a horrified halt. "You lie!" he screamed.

"Short weight and short change!" came from another part of the audience.

Distum leaped from the platform and tried to fight his way through the crowd to wherever this latest calumny had come from. In a twinkling, the crowd was transformed from a bored audience to an unruly mob. Maj Arnt's defenders gave up their harassment of the candidates to try to restore order. So did the candidates, who wanted to get the affair over with.

When Haylor Voine raised his voice in an appeal for fair play in the political arena, one of Maj Arnt's defenders, whom Raarn had carefully briefed on the unsavory details of Voine's own business career, couldn't resist the temptation. He left off his police duties to shout him down. A shrill debate quickly developed between Voine and his critic. Ornon Guntzor, the amiable butcher, attempted to quiet things, but someone chimed in with a recital concerning short weight and tainted meat that quickly brought Guntzor to paroxysms of anger. The cheap mugs the *klono* had been dispensed in began to be aimed at the speakers' platform. Windows were broken. Fights broke out, the platform was overturned, and all three candidates disappeared—probably into friendly doorways around the square.

Maj Arnt's public defenders went to work in earnest, but the rioting continued for a couple of hours. The narmlich himself along with his narmlicher finally quieted things by appearing at an upstairs window and asking for restraint. He was, after all, the most popular narmlich the narm had ever had, and his narmlicher was just as popular; everyone recognized them instantly.

He told his subjects that the election of an official was a serious responsibility for the citizens and had to be practiced in an atmosphere of calm deliberation so that the best candidate could be selected. Since the citizens obviously did not understand that, he was postponing the election.

Narmport subsided into an uneasy night. Presumably the citizens were discussing in great detail their experiences of the day, and they had plenty to talk about. The candidates also were reflecting on their experiences with somewhat different results. The two merchants were indignant that anyone would impugn their reputations. Haylor Voine was indignant that he had lost a chance at a profitable job.

Voine was out early, organizing support for himself, and the narmlich and narmlicher were at breakfast when Voine's protest procession arrived at the palace. Normley indignantly sent word to him that the narmlich only transacted business during office hours. Since he had no office hours, this seemed safe enough.

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For Voine, it was fanning the flames. He gave a rousing speech in front of the palace that continued until Maj Arnt and his defenders decided the nonsense had gone far enough and hauled him and his principal followers off to jail with Voine continuing to demand what right the narmlich had to decide how the narm's tax money should be spent.

Raarn listened, shaking his head in amazement. "In one day, this narm has gone from a monarchy to socialism! How did he come by ideas like that?"

The narmlich decided it would be diplomatic to release the prisoners; Voine, as soon as he put the jail behind him, organized another protest march. The other two candidates for comptroller, having had time to reflect on the events of the previous day, decided that the insults must have come from Voine or his supporters. They organized their own protest marches. The three marches, the one led by Voine protesting the postponed election and the narmlich's right to do this or that, and the other two protesting Voine's campaign tactics, collided at the palace, where another riot ensued.

Raarn, looking down at the churning upheaval in the palace square, where Maj's Arnt's defenders were vainly trying to restore order, had another flash of inspiration. "Why not let your subjects choose their own candidates for comptroller?" he asked.

"How would they do that?" the narmlich wanted to know.

"We'll have to think of a way," Raarn said.

Once Maj Arnt had cleared the palace square and hauled the principal agitators off to jail, Raarn gave his public defenders a new assignment. They set about dividing the city into districts. A short time later, hastily-appointed district clerks went to work at tables placed conspicuously in every district under signs that read, "Whom do you want for your narm's comptroller? Nominations accepted here."

The clerks were taught simple explanations for the nomination procedure and the general election that would follow. These seemed to produce results of a sort. Enough people expressed interest to keep the clerks busy, so the population was being slowly educated in the mechanics of a democratic election whatever the result would be.

At the end of the day, the agitators, including Voine, were again released from jail. He promptly disappeared and was not seen again for several days. In the meantime, each district had produced two or three nominations for comptroller, each of them with several endorsements. Raarn was feeling pleased with himself.

"That's going to be an awfully long ballot," Normley observed.

"There'll have to be a runoff," Raarn said. "A second election with just the three candidates with the most votes."

"How do you explain that to the citizens?" Normley wanted to know. "They think they've been nominating the new comptroller. Now they'll find out they've only been nominating someone for an election that won't really decide anything. I'll be surprised if they don't revolt."

"It's all unfamiliar territory," Raarn said cheerfully. "It'll work out.

Then Voine reappeared. This time he managed to fill the palace square with his own supporters. The gathering was orderly because there was no one to squabble with them. It remained orderly only until it heard Voine's speech.

"Why does the narmlich need a comptroller?" he demanded. "He needs someone to count your tax money for him. Why should you be paying taxes on everything you buy so the narmlich can live in luxury and be so rich he hasn't got time to count his own money? Why shouldn't you spend your tax money yourself? It's all right there in the palace where the narmlich has hoarded it. Let's go take it!"

With a screaming Voine at its head,

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the mob rushed the palace. Narmlich and narmlicher, along with Raarn, narrowly escaped by way of an inconspicuous side entrance. Following a confusing network of alleys, they managed to reach Ely's bakery safely.

The plump baker, when he heard what had happened, burst into laughter.

"Never mind," Raarn said. "We'll recruit more public defenders, clear the mob out of the palace, and keep Voine locked up until he's learned a little humility."

Ely continued to laugh. "You can't!" he exclaimed, his massive stomach shaking with merriment.

"What do you mean, we can't?" Normley demanded. "I want my narm back!"

"There's been a democratic uprising," Ely chortled. "The enraged populace has thrown out the entrenched king and queen. The IPR Bureau can't put itself in the position of intervening to restore the king to power merely because it has a financial interest in maintaining the narm as a kingdom."

"Democratic uprising, nonsense." Raarn exclaimed. "That character Voine is looking for ways to line his pockets. We need changes of clothing—quickly."

The portly baker's clothing posed problems for them, but they managed to create a presentable effect. The narmlicher, Vladia, had fewer problems with a gown belonging to the baker's wife, female clothing almost being a case of one size fits all."

They ducked out a back entrance with Ely's cautions pursuing them and circled back to the palace. The crowd still filled the palace square. Raarn caught Maj Arnt's eye and beckoned to him. He gave him careful instructions, and Arnt slipped away along with a contingent of his defenders. Raarn, Normley, and Vladia separated.

When they'd had time to get into position, Raarn bellowed, "Where's Voine?" Normley and Vladia repeated the question from widely-separated locations. Others picked it up. "Where's Voine?" echoed about the square.

"He's in the palace stealing our tax money!" Raarn bellowed.

"That's money for dredging the river, and building parks, and repairing the docks so everyone can have work. Voine is stealing it!"

"He's stealing the money the narmlich uses to keep the streets clean and repaired and for erecting stalls on market day!" Normley called.

"He's stealing the money that pays the salaries of the Public Defenders, who keep us safe from other narms' riffraff!" Vladia called.

"He's stealing money intended for children's playgrounds."

"He's stealing your money—*your* money—that the narmlich is using to improve your lives!"

"He's stealing money the narmlich was using to build roads and bring prosperity to Narmport!"

"He's stealing *your* money!"

By that time the crowd had got the idea. "He's stealing our money!" came the cries.

There was another surge toward the palace. The defenders eventually halted it, but clearing out the palace took longer. Then Arnt, with several of his lieutenants, appeared from the rear of the palace with Haylor Voine and his principal followers firmly in custody.

"The crowd flushed them out," Arnt said. "Voine has his pockets stuffed. All of his followers have their pockets stuffed. Incredible! They actually went into the narmlich's palace and stole things! What kind of foul scum are they, stealing from the narmlich? They don't seem to have found any money, though."

The undeposed narmlich said with satisfaction, "They couldn't find any. I had Bureau Headquarters install a modern safe for anything that was really valuable as soon as I became narmlich." He turned on Raarn. "You expected them to loot the palace, didn't you? That's

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why you sent Arnt and his defenders to the rear to grab them when they came out. But this is an incredibly honest society. No one steals anything. Look at the way the people pay their taxes. What made you suspect that Voine and his cohorts would steal?"

"He already had that reputation from his wagoning, and the other candidates spread it when they thought he'd been impugning their reputations. Look how quickly the crowd picked up the chant when we suggested that Voine was in the palace stealing the tax money. They'd heard enough about him to believe it. Why is thievery so rare here?"

"Maybe because the penalty is so severe. Fifty lashes, a year of hard work, and permanent exile."

Maj Arnt was supervising the emptying of the culprits' pockets. An astonishing pile of knickknacks took shape.

"Considering that they only took what their pockets would hold, they seem to have stolen quite a lot," Raarn said. "Let justice be done."

They moved back into the palace. When the crowd saw the narmlich and the narmlicher at the upstairs windows, they burst into wild cheers. The two monarchs waved enthusiastically.

When they turned away, Normley said to Raarn, "By the way, sir—" and broke off. He had never before seemed at a loss for words, but he was now. He paused uncertainly.

"What is it?" Raarn asked.

"Don't you think it would be better if I simply appointed a comptroller?"

"You can't," Raarn said. "You have all those nominating petitions to deal with."

"I'm wondering whether I might be able to switch them to nominations for park commissioners."

Raarn nodded thoughtfully. "It would still be an election. And each district could have its own park commissioner, which would eliminate the runoff election."

Normley hesitated again and then said, "I think, actually, it would be much simpler if I appointed the commissioners, too, and we eliminated the election entirely."

It was Raarn's turn to hesitate. He was about to lose his grip on an idea that had become very dear to him. He contemplated the mess that the rioters had left in the palace square below.

"All right," he said. "Perhaps the time simply isn't right. Appoint them."

Raarn's office seemed almost excessively quiet after the turmoil of Narmport. He dealt with a stack of papers that had been awaiting his attention. Then he paused and studied the framed motto on the wall across from his desk.

"Democracy Imposed From Without . . ."

"Amen," Raarn breathed and reached for the next stack of papers. □

(EDITOR'S NOTE: This story continues the saga of the Interplanetary Relations Bureau, which has been the subject of two novels [The Still, Small Voice of Trumpets and The World Menders] as well as shorter works [e.g., "The King Who Wasn't," Sept. 2001 Analog].)

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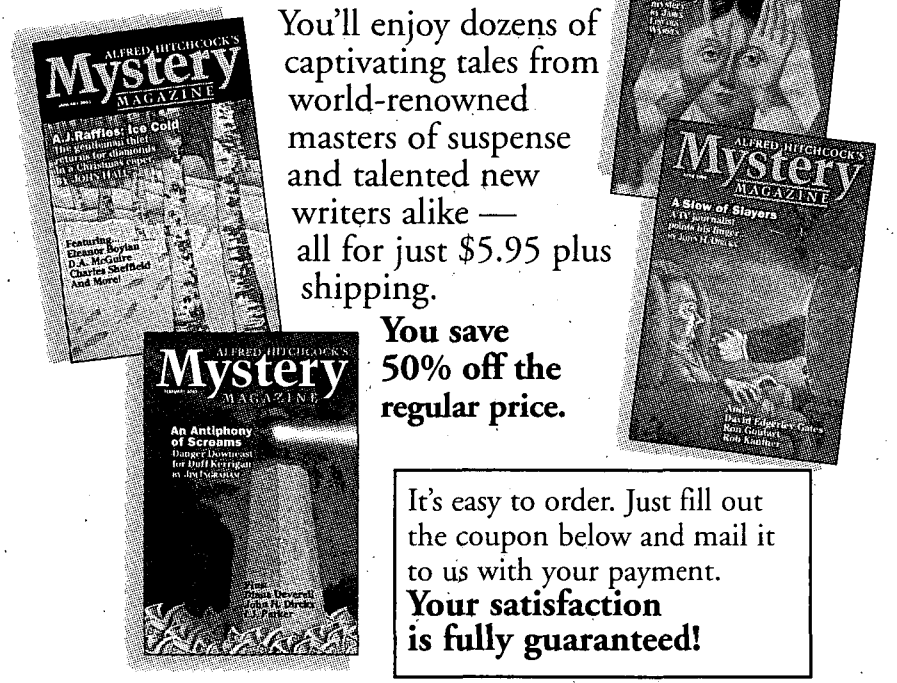

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PERSONALIZED DRUGS:

The Future of Pharmacogenomics

Kyle Kirkland

In the March 1966 issue of *Analog*, then-editor John W. Campbell wrote an editorial that severely criticized the government for banning a drug called thalidomide. For those of you who know something about the history of this drug, writing such an editorial might seem an awfully strange thing to do. Thalidomide was a tranquilizer sold mostly in Europe in the 1950s and '60s, until people discovered that under certain circumstances it can cause severe fetal deformities. Thousands of pregnant women who took the drug gave birth to horribly disfigured babies, and thalidomide was summarily banned.

Well, of course it was banned. It's one of the most infamous drug disasters of all time. What was Campbell complaining about?

Simply this: the only bad side effect of thalidomide occurred in fetuses—and mostly only *human* fetuses are effected, by the way, which was one reason why safety tests done earlier with animals didn't catch the danger (although some people claim that the side effect was not detected because the animal tests had been poorly or incompletely done). The point is that most of us happen not to be a fetus, nor are many of us, excepting pregnant women, in the habit of carrying one around. Otherwise, thalidomide worked well; furthermore, in addition to its sedative properties, the drug had promise in treating a number of disorders for which little else was then available. Campbell obviously recognized the need for pregnant women to avoid the drug, but why, he wondered, should the rest of us be deprived of its benefits?

It took 32 years, but the government agency responsible for drug safety in the U.S.—the FDA (Food and Drug Administration)—finally took Campbell's advice. In 1998, thalidomide was approved to treat a rare disorder called erythema nodosum leprosum, and it may get approval for other diseases, like cancer, shortly.

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Will it always take that long for the medical authorities to recognize that people aren't all the same and shouldn't be treated as such? Unfortunately, to some observers the current trends seem to predict a more automated, *less* personalized future for medicine. When carried to the extreme, it makes for an amusing story, such as H.G. Stratmann's satire, "The Human Touch," in the May 1998 issue of *Analog*.

Hopefully stories such as Stratmann's won't turn out to be prophetic. The lack of personalized treatments with therapeutic drugs is a particularly serious problem. A study published in the *Journal of the American Medical Association* estimated there were two *million* cases of adverse drug reactions in the United States in 1994 (Lazarou et al., 1998), even when the drugs are correctly prescribed. About 100,000 were fatal.

Probably all of us have experienced some kind of bad reaction to a drug. For me it was with penicillin. Such reactions are common because there's no way to tell in advance who's especially susceptible to a drug's side effects and who isn't. And it's not just side effects which differ from person to person: a drug's effectiveness can also vary by quite a bit, ranging from totally effective to totally worthless.

But that might change in the future. Probably all of you have heard about the human genome project, in which scientists have sequenced virtually all of the three billion DNA bases of the human genome. One of the commonly cited applications for this project—and part of the justification for the billions of dollars it took to complete—is a field of research with the unwieldy name of "pharmacogenomics." One of the major aims of pharmacogenomics is to develop personalized drug treatments.

This makes sense because genetics is responsible for much of the wide variance in drug reactions among individuals. Lifestyle, diet, and so forth also play a role, but in many cases it's your genes that matter the most.

The science behind pharmacogenomics is relatively straightforward, and some experts are confident that by 2020 we'll have widely available personalized drug treatments for many disorders (Collins and McKusick, 2001). It's quite possible that this prediction will come true, but sometimes it isn't a lack of scientific knowledge or technique that holds you back. There are several major difficulties with pharmacogenomics—two of which, as I'll explain later, have nothing to do with science.

Pharmacology and Genomes

Pharmacology is as old as the hills, although it didn't always have a fancy name. The study of drugs goes back at least as far as ancient times, when people experimented with various herbs to alleviate pain and suffering.

The study of genes in relation to pharmacology, however, is much more recent. In the 1950s, medical researchers noticed that the tendency to react to a specific drug in a certain way seemed to run in families. They quantified this by studying the physiology of monozygotic twins and comparing it to the general population. ("Mono" meaning one and "zygote" meaning fertilized egg: monozygotic twins have identical genes because they come from the same fertilized egg cell, which for some reason went on to produce two separate embryos after it made its first cell division.) By monitoring bodily fluids such as blood, researchers discovered that the way monozygotic twins respond physiologically to a drug is remarkably similar, whereas two unrelated people generally have quite different responses.

Genes affect a number of important properties that influence how well or how poorly a drug works. First a drug has to be absorbed by the body before it can be effective. Next, it has to get to the target tissue; if the drug isn't specifically applied to the target, then it has to get where it's needed via circulation.

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Drugs are also subject to metabolic activity—the body will chemically break them down into different compounds, which are often consequently described as a drug's byproducts or "metabolites." Finally, the drug and its metabolites will eventually be eliminated. The speed, thoroughness, and manner in which all of these processes occur will determine the person's reaction to the drug.

Although all these properties are important, pharmacologists are frequently most interested in metabolism. How fast and into which compounds a drug is metabolized is often critical, especially in drugs whose metabolites have some sort of physiological effect. In fact, the activity of quite a few drugs depends on one of its metabolites. Codeine, for example, is a commonly prescribed painkiller whose effects rely on the body's conversion of codeine to morphine.

Metabolism is the work of enzymes—the molecules which help turn one compound into another in the body. Enzymes are virtually always proteins and are so important that biologists occasionally describe the cells of the body as nothing but "bags of enzymes." Enzymes catalyze chemical reactions, and usually a single enzyme will speed up only a single, specific reaction. Although you may not like the conception of life as a "bag of enzymes"—I definitely don't—life *does* basically consist of chemical reactions, as cells convert raw materials into complex molecules which perform various functions. These reactions can occur without enzymes, but very, very, slowly—which explains the need for catalysis. (Science fiction fans such as myself can imagine creatures who possess only a few or no enzymes at all; these creatures would presumably be about as nimble as glaciers—and exceptionally *patient*.)

If you don't have a certain enzyme, your cells won't be able to perform a specific reaction. Consider codeine again: in people lacking a functional copy of the enzyme that converts codeine to morphine, codeine will have no analgesic effect. This is true for about 6-7% of the Caucasian population (Fagerlund and Braaten, 2001). (Which raises another issue: drug reaction tendencies are often correlated with ethnicity.) And if an enzyme you have doesn't work as well as in other people—or perhaps works *too* well—your response to a certain drug may be present but abnormal.

So, enzymes are crucial, and enzymes are proteins, and proteins are ultimately the product of genes. Logically, having the sequence of the human genome will be of great use here.

But here's a surprising fact: there's much more to it than just knowing the genomic sequence. That seems to astonish a large number of people. I remember being asked to write an article on genetics right after the first draft of the human genome sequence was released in the summer of 2000; in the article I mentioned that most of the potential benefits were decades away. The distraught editor called me up and said: "You kidding? *Decades?*" He assumed it would take a year or two.

Unfortunately, there are still plenty of hurdles yet to clear in pharmacogenomics. A few critical needs must be met: (1) find out who has what genes; (2) discover which genes cause what drug reaction; and (3) manufacture and prescribe drugs accordingly. None of these things are going to be trivial—not even number three.

Who Has What Genes?

Simple. Sequence everybody's DNA. Right?

If only we had the time and money. And everybody's permission, which wouldn't be likely, at least in the current climate of distrust.

Which raises an interesting question: whose DNA was sequenced in the human genome project? It's all well and good to talk about *the* human genome as an abstract entity, but when it's time to

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determine the bases—the A, C, G, and T sequence—you've got to use *somebody's* DNA.

There were actually two different groups of researchers working on sequencing the human genome. Each of them did the whole genome, although using different methods; for a while it seemed like they were in a race, but they finished up the first draft amicably enough and published their reports at the same time. (Work still continues in a few labs as some gaps are filled and accuracy is checked.) The U.S. government's group, which is officially known as the Human Genome Project, was led by Francis Collins; the other group was a private company by the name of Celera, whose CEO at the time was Craig Venter.

Back when the government's project first began sequencing in earnest (in the 1990s), I heard a rumor that practically all of the DNA they were using came from a certain junior scientist on the west coast. Ultimately, however, they used a small number of anonymous donors from diverse ethnic groups. They could use more than one person because everyone's DNA sequence is roughly 99.9% identical (excluding the difference between the X and Y sex chromosomes). That's the reason people speak of "the" human genome.

Venter's group also implied that they had used an anonymous and diverse set of donors, but later Venter said that the DNA sequenced by Celera was mostly *his*. That admission didn't go over too well with the editor of *Science*, which had published Celera's report; he called it "tacky" (Kennedy, 2002).

The selection of a diverse group of donors wasn't just a nod to political correctness. While it's true that everyone's DNA is pretty much alike, the 0.1% that isn't happens to be extremely important.

So exactly how do people's DNA differ? Several ways are imaginable: a few long stretches of DNA could be different, or a whole lot of single bases. It turns out that it's mostly the latter.

They go by the name SNP—single-nucleotide polymorphism—and often pronounced "snip." If you compare the DNA sequences of two different people, you'll find them identical for long stretches until suddenly you hit a single base—or nucleotide, as some people like to call it—which isn't the same. There are only four possibilities (A, C, T, or G), so the number of substitutions is obviously quite limited; the vast majority of SNPs, in fact, have only two "alleles." The genetic difference between you and me is for the most part due to our unique set of SNPs.

SNPs don't include all single-base changes, by the way: everyone has a few errors or changes in their DNA that are highly unusual and not present in very many other people. These are called mutations. By definition, a SNP must be present in at least 1% of the population; it's actually sort of arbitrary to make the cutoff at 1%, but scientists believe it's necessary to somehow distinguish between SNPs and mutational errors.

Considering the importance of SNPs, it'll come as no surprise that scientists have tried to find as many of them as possible. It's estimated that about one base out of every thousand is polymorphic, which means that there are about three million SNPs in the human genome. A consortium of pharmaceutical companies, along with the huge British research foundation Wellcome Trust, recently identified one and a half million of them. Obviously they used more than one anonymous donor—at least 24 of them, in fact, and they were careful to select a diverse lot. You can find out more by aiming your web browser at http://snp.cshl.org.

SNPs make genetic research easier, since it means that you don't have to sequence all of the DNA. Unfortunately, even if you find a SNP that seems to correlate with a trait you're looking for, it doesn't mean that you've automatically

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found the gene responsible for it.

You probably know that only a few percent of human DNA contains genes. (Some of the other DNA contains sequences that regulate how and when a gene is expressed; but the function, if any, of the rest is not yet known.) Thus, chance alone would suggest that only a few percent of SNPs are located in a sequence that actually codes for a protein. And if you know anything about evolution, you might guess that fewer SNPs will be found in genes than elsewhere, because most genetic changes aren't helpful and will be weeded out by natural selection. Polymorphisms in the rest of the DNA won't necessarily be subject to such pressure, so you'd think they would be more common. That does seem to be the case.

A bit troublesome, isn't it? Presumably there *is* a gene—most commonly more than one—responsible for or strongly contributing to the trait that you're studying. But genetic differences aren't always due to SNPs; some diseases, like Huntington's, have nothing to do with SNPs. (In Huntington's disease, the affected gene is much larger than it should be. For some unknown reason, it has an excessive repetition of a certain small sequence.) And even if the genetic difference you're searching for *is* a SNP, it's only *one* SNP—or a few—among millions. You've narrowed down the search, but it's still a pretty big haystack and the needle could be anywhere.

There is, however, a saving grace. It makes genetics much more complicated than most people realize, but it does have its advantages.

SNPs aren't necessarily independently inherited. Nor is a lot of DNA. DNA is packaged in chromosomes and there are 23 pairs of them in human cells. You get one of every pair from each parent. That would seem to make it a lot easier to track genetic inheritance, and it would be, if all you had to do was look at a bunch of large chromosomes. Alas, it's not that simple. It's not just whole chromosomes that are shuffled in the process of reproduction: each pair of chromosomes also exchanges little bits and pieces with each other. It's nature's way of increasing variability, which makes an even bigger lottery from which natural selection can choose.

The saving grace is that the little pieces of DNA *do* tend to be inherited together, so that genes and the surrounding bases—including SNPs—will be passed along together. For example, an "A" nucleotide at a specific SNP location will be passed from parent to child along with any gene that happens to be nearby. This specific nucleotide polymorphism is thus a *marker* for nearby genes. That makes it easy to study inheritance in families, for if you find a SNP that correlates with a trait—in other words, when a person has an "A" at that spot, he or she is also likely to have the trait—then you figure that even if the SNP isn't actually in the gene itself, the gene is nearby.

This is advantageous because you don't have to look at all the millions of SNPs—or even know where all of them are—to find the gene or genes you're looking for. Just select a group of SNPs that are reasonably spaced and cover the whole genome. Then there are only thousands, not millions, to search. What's more, it's possible that SNPs could be correlated with each other, thus further reducing the search (this is the basis for the "haplotype" map that researchers are talking about these days). Your search probably won't turn up the SNPs, if any, that are the actual genetic source of the trait, but the gene will presumably be lurking somewhere in the vicinity. That's presently the only thing that makes such searches manageable.

That's the way to study genetics in families. But you need a lot of families from which to draw your samples. However, in principle it's also possible to study a population of unrelated people in this way. Traits not only run in fami-

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lies, but also in ethnic groups and, to a lesser degree, in all of us. The reason is that we as individuals are never *totally* unrelated to each other: we're not one big happy family, but our genealogies start to converge if you go back far enough. While SNPs and little bits of surrounding DNA will almost always be passed along with a nearby gene in families, in *some* cases SNPs will also be correlated with neighboring genes for "unrelated" people in a population, although the correlation may be exceptionally weak. That makes it possible to use the same strategy as in families: partition the genome into SNPs at various intervals and go fishing for correlations. But in order to find what you're looking for, you have to use narrowly spaced markers and a lot of people, plus do a whole mess of statistics. It's not a sure bet, and as of now no one even knows if it's a likely one for most traits or disorders.

Which Genes Do What?

In order for pharmacogenomics to work, you need to determine a few vital facts about a reasonably large sample of people: you need to know how each person responds to a drug in question (their phenotype, in other words), and you need to know their corresponding genetic profile (genotype). Once you've established which genotype corresponds to what phenotype, you can use this knowledge to predict, in the rest of the population, which patient is going to react to a drug in what manner if you know the patient's genotype. That will certainly cut down on the adverse drug reactions, though it won't eliminate them—in many cases, pharmacogenomics will unfortunately only give you probabilities, not certainties. But it's much better than trial and error, and it means that in many instances you can avoid serious adverse reactions by judicious drug selection. It's also likely that doctors could optimize quite a few treatments, since some genetic make-ups will respond better to certain treatments than others.

Sometimes getting the pharmacogenomic data isn't such a big deal. In some cases, scientists already know where in the genome to look. This is true for drugs in which the metabolic pathway and activity is well known, which means researchers know which enzymes are critical. If you know which genes make those enzymes, and you know the location of those genes, you're in business.

In fact, there are already a few examples of this in clinical medicine. Physicians now routinely check the gene for the enzyme thiopurine methyltransferase in patients before giving them drugs like azathioprine, mercaptopurine, or thioguanine. In about one in three hundred Americans, this enzyme doesn't work, which could lead to a potentially fatal drug reaction.

If you know where the needle is, the immense size of the haystack is irrelevant. But when you don't know, which is true for most drugs today, then it becomes a problem.

It gets even worse. Many drug reactions are strongly influenced by more than one enzyme. And when you're dealing with combinations of genes rather than a single one, the number of possibilities increases dramatically. That will typically require a huge increase in the amount of time you'll have to spend searching.

Even if you've narrowed down the search to thirty thousand evenly spaced SNPs, it's still very costly to rummage through every one in order to establish a correlation between genotype and phenotype. Remember, you have to do this for *each* person in your sample, and you have to use a large number of people because what you're looking for is a small statistical fluctuation. The price per SNP per person has been estimated to be anywhere from a few pennies up to a dollar—inexpensive unless you've got to do millions of them, as we have to here.

So how can anyone be optimistic

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about pharmacogenomics?

Easy. Science doesn't stand still.

There are two developments that will probably have a strong impact on pharmacogenomics. One is the so-called "gene chip" or "microarray." This little device relies on the fact that DNA is normally a double helix: there are two strands whose sequence is complementary. The complement for the base A is T, so where one strand has an A, the other will have T. It works similarly for C and G. Gene chips have a vast number of single-stranded DNA segments anchored to specific locations, and when a sample of DNA (also single stranded) is poured in, anything in the sample that is complementary to one of the segments will bind to it at the proper location. It's like doing a lot of chemical reactions in parallel, all in one fell swoop. Of course, the difficulty is making the gene chip in the first place, but people have been doing this for a number of years and they're getting better and better at it.

Another important development is bioinformatics. Computers and software are becoming increasingly important in biology. Of special importance is that fact that evolution is conservative and, hence, knowledge of one species or one biological process will frequently shed light on others. Software that can quickly analyze a lot of data is tremendously helpful in this regard. If you can only get your foot in the door, you'll have an opportunity to do much more: if you learn something about what a particular gene does in a mouse, for instance, then chances are good that there's something similar in humans and other species.

Gene chips and bioinformatics might not be the final solution, but they'll help in learning more about the physiological processes underlying drug reactions—so that we can narrow down the search—and/or they'll make brute-force searches more economically feasible. Although it's always somewhat dangerous to extrapolate, it's fairly certain that the science here is doable.

It's the other stuff that might become the snag.

Genethics

Most of us are quite fond of our privacy. We divulge our secrets grudgingly, if at all. And many people believe that their genes are *nobody else's* business.

That's going to make pharmacogenomics a bit tough. Even if we manage to find a sample of donors and discover which gene does what, you have to know a patient's genotype if you're going to apply that knowledge in a medical situation.

One vision of the future is that we'll have a nationwide database containing everyone's genotype. Access will be limited to clinicians, and their data requests will be limited by a need to know (no random peeking allowed). Whenever a patient needs a medication, the attending physician consults the patient's genotype and selects the optimal treatment.

Think that's going to happen? I, for one, have my doubts. It won't happen without a fuss. Not in the United States, anyway.

Why do so many people fear genetics? Whether it's genetically modified food—oh, horrors, frankenfood!—or genome-based medicine, a fraction of our society has problems dealing with the fact that nature no longer has exclusive control and access to genes.

Perhaps the main reason some people are afraid of having their DNA sequence stored in a database is that they believe such knowledge could be used against them in some way. A commonly cited concern is that insurance companies will use genetics as a basis for discrimination. One scenario describes the plight of a genetic underclass who are unable to obtain insurance, or even employment, because of their faulty genes.

To me this is a pretty silly argument. All of us have a mixture of "good" genes and "bad" genes. Unfortunately, however, it's true that in a very small number

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of people one of the bad genes is *really* bad. Having the defective gene for Huntington's disease, for instance, means that the person is destined for a presently incurable and ultimately fatal illness. Such information could indeed be used against the person. In such cases it's probably necessary to have legislative sanctions—something that already more or less exists in a lot of states in the U.S., as well as in a number of federal regulations, though as yet there's no comprehensive federal law. But such information isn't supposed to fall in the wrong hands in the first place: the database would be purely for clinicians (and possibly researchers).

Besides, very few of us will have need of such protection and I can't believe it would ever become a big problem. The potential benefits of pharmacogenomics far outweigh it.

In fact, there are already countries where a nationwide DNA database is being compiled, or there are plans for doing so. In 2003, England will launch "BioBank," in which it's hoped that half a million citizens will contribute DNA samples and medical information. But the best known example is Iceland, where deCODE, a private company, has been granted a license by the government to establish and maintain a genetic database for its citizens. The database contains medical and genealogical records, for which Iceland is well known, as well as "biological samples." Although in the beginning it's going to be more of a scientific research tool, eventually it will undoubtedly improve the quality of medicine.

However, several things about Iceland's approach are bothersome. For one, deCODE is a *private* company and thus ever subject to ye old profit motive. Iceland's government has forced them to institute rigorous security measures so that genetic information doesn't become public, but some people worry. I would, too; having a private company in charge of a gene database is about as comforting as having a fox guard the hen house.

Another troubling thing: it is assumed that all citizens will participate. If you don't want to, it's up to you to tell the database managers that you "opt out."

But only about 20,000 people have opted out as of September 2002, according to http://www.mannvernd.is/english/optout.html (a website run by vociferous critics of deCODE, by the way). Iceland's population is about 275,000. Perhaps most people in Iceland recognize the value of things like pharmacogenomics.

Which is more than I can say for this country. Will *we* ever have a nationwide database?

There are already a few companies in the United States which hope to establish a DNA database. Examples: First Genetic Trust, Inc.; The Gene Trust, a project of DNA Sciences Inc.; and Genomics Collaborative Inc. But they don't have the support of the government and their efforts seem to be mostly aimed at establishing a resource for clinical researchers. These companies lack the resources and the credibility for anything more ambitious.

Perhaps the best approach for our slightly more skeptical citizens is different than for Iceland. Let's put the database in the hands of a large and reputable nonprofit foundation. And let's not assume that everybody wants to participate; if you want to join, then you have to sign up and provide a DNA sample and your medical records specifically for the purpose.

I suppose there will always be people who refuse to participate. There are probably still people who stuff their money under a mattress rather than putting it in a bank.

But of course only those in the database will ultimately enjoy the benefits of pharmacogenomics. Which, by the way, will certainly not escape the notice of health insurance companies. And as a future participant, I'd be delighted to tell

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them so.

Why? Because health insurance companies are *allowed* to discriminate. They adjust their rates based on risk. They can increase the rate for anybody, as long as actuarial tables prove that the person has an increased risk. They do it all the time. If you smoke cigarettes, you pay more for insurance.

People who don't participate in the database will be subject to the same adverse drug reactions and other similar maladies that plague us today. And this won't be their only problem. Non-participants shouldn't be surprised—nor in my view would they have any right to be upset—if they end up shelling out quite a few dollars more for insurance than the rest of us.

Pharmaceutical Companies

The ultimate promise of pharmacogenomics is personalized medicine. But that can only happen if the pharmaceutical companies get with the program. And they're not likely to be entirely happy about it.

It's simple economics. The big pharmaceutical companies are especially interested in finding drugs for the most common disorders. The more common the better, since that translates into more customers.

This perfectly legitimate business practice is underscored by the cost of developing a drug and getting it on the market. Most of the recent estimates for this are around 500 million dollars. It takes years of work and a huge investment in resources to find and then test a drug, and you have to include the cost of so many promising candidates which for one reason or another ultimately fail to get approved.

Not exactly cheap. Is it reasonable, then, to suggest that pharmaceutical companies reduce their potential market for a drug from millions to . . . er . . . one?

Obviously not at a half a billion bucks per drug. Sorry, but it won't happen.

Of course, many personalized medications probably wouldn't be so expensive to develop, because all that would be needed in most cases is a drug that can be tweaked this way or that to accommodate various physiological differences. And many of the benefits of pharmacogenomics can be had by simply discovering how to judiciously select drugs for each individual; you don't have to develop a drug for each person.

Still, pharmacogenomics will reduce the potential market for any given drug. It's bound to. These days, a drug may be prescribed for—and hence sold to—the majority of patients with the corresponding disorder; but with the advent of pharmacogenomics, a drug will be prescribed only for the fraction of patients for which it's the most effective and safe medication. Good for us, but bad for the seller.

And to realize the vast potential of pharmacogenomics, we need to have a large array of available medications from which to choose. Since one size doesn't fit all, you've got to have an assortment.

But that's not good for the seller either. Things are cheaper to make when they're mass-produced; it costs more to individually tailor a product.

So why, you might wonder, did pharmaceutical companies invest in the search for SNPs? (As I mentioned earlier, a number of them contributed to the SNP consortium.)

The main reason is that they hope to reduce that 500-million-dollar price tag per drug. A large chunk of the cost of developing drugs stems from testing: the drug has to be reasonably safe and effective for the general public. Proving it to the FDA's satisfaction takes some doing, including expensive clinical trials involving human patients. Clinical trials would be far easier and cheaper if you didn't have so many pesky patients who don't get better when you give them the experimental drug, or worse, have bad side effects, which ruins the whole deal. And the reason for the wide variability

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in response to the drug is . . . well, you already know.

To improve their chance of getting a drug approved, Big Pharma hopes to homogenize their clinical trials. Maybe there's a SNP profile that bioinformatics or some other data suggests will be optimal. So you select the appropriate patients. This vastly improves your chances of success, and consequently lowers the cost of getting a drug approved.

Of course, it will also mean that it's approved for *only* people with that specific genetic profile. So in a way, pharmaceutical companies have already caught on to pharmacogenomics. And maybe they'll pass on a portion of their savings to us, the consumers. Maybe.

The big downside is that only the more common SNP profiles will get targeted, because they're the biggest pool of potential customers. Something similar clearly happens today as well: many rare diseases are ignored because it's not economically viable to develop treatments for them. The governments of some countries, including the U.S., subsidize drug development for such diseases, which alleviates the problem to a certain extent. (In the U.S., this is called the "Orphan Drug Act.") Still, the problem isn't going away, and pharmacogenomics is going to have to deal with it or fail to live up to its ultimate promise. Pharmacogenomics could even exacerbate the problem, making it difficult to get *any* treatment if you happen to have an unusual genetic profile.

And so it goes. The interaction between science and economics and society is to me one of the most fascinating things about our rapidly changing, technologically sophisticated world.

Will pharmacogenomics come through for us by 2020?

The safe bet is that it will for some things and it won't for others. A drastic reduction in serious adverse drug reactions would seem to be pretty certain. And to a small degree, there will be optimized treatments for some of us—at least those of us who don't hide our genotypes under the mattress. Presumably, these improvements will also help reduce our medical expenses. But I predict that for the majority of cases, individualized treatment isn't going to happen for a while. And when and if it does, it will likely drive up the cost of medical treatment in proportion to the degree it becomes individualized. With the price of medicine already sky-high, that's something we might simply be unable to afford. ■

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Everything should be made as simple as possible, but not one bit simpler.

—Albert Einstein

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BIOLOG Jay Kay Klein

Kyle Kirkland has locked horns with the same dilemma that has gored nearly all writers. On the one horn, you need to hold a job in order to eat until you can sell steadily. On the other horn, working a 9-5 job saps your time and creative energy. In addition, today's financial environment resembles the one John W. Campbell ran into when he completed his engineering training in the 1930s. Already an admired SF writer, Campbell gratefully located a paying editorial job in 1937 at this magazine, known then as *Astounding Stories*.

Kyle wistfully wishes such a prospect were open today. He offers more than a simple engineering degree, having earned a Ph.D. in neuroscience from the University of Pennsylvania in 1998. This followed a B.S. with Highest Honors in psychology and mathematics from the University of Southern Mississippi in 1991. For three years, he had a post-doc fellowship in models and computer simulations, and currently has one in vivo electrophysiology, but his job as a junior scientist researcher at U. Penn. may soon be gone if the grant money runs out.

Kirkland finds science enjoyable and he has fun in his lab—though it would be better with less politics and desperate competition. Getting prepared to squeeze any lemon handed to him, his consolation lemonade will be the opportunity to write full time. His brilliance in academia was not evident during high school in Clinton, Mississippi. An interlude of five and a half years in the U.S. Air Force as an instrument technician immersed Staff Sergeant Kirkland in practical engineering problems. He has since published numerous papers with jaw-breaking and eye-straining titles. In addition, he's had five fact articles in *Analog*, starting with the July/August 2000 issue, plus three short stories since March 2002. Like many long-time readers, he loves the magazine. He says, "It contains a whole lot of scientific speculation, good reads, clashing opinions, imaginative creations, and glimpses of the mind and visions of people who are usually quite intelligent and have, for the most part, done their homework."

Kyle is passionate also about all aspects of science. The fiction of science explores the possible ways we and our world will change. We must chart the future lest much knowledge brings much sorrow. SF's entertainment must be coupled to stimulation. He thinks too many writers emphasize the former while neglecting the latter. The ideal coupling, he thinks, was achieved by Isaac Asimov, and he remains Kyle's favorite writer. An agent once told Kyle his work reminded him of the Good Doctor's. Dr. K took it as a compliment, though he realizes Dr. A. was often accused of lacking the literary style so admired since the early eighteenth century. Asimov was writing in the twentieth century, in a way that can still be admired in the twenty-first century for its logic and clarity, instead of any extrinsic arabesques of language.

A Kirkland story starts with the plot idea that grows in details over days and weeks. The setting, characters, and background are firmed before putting

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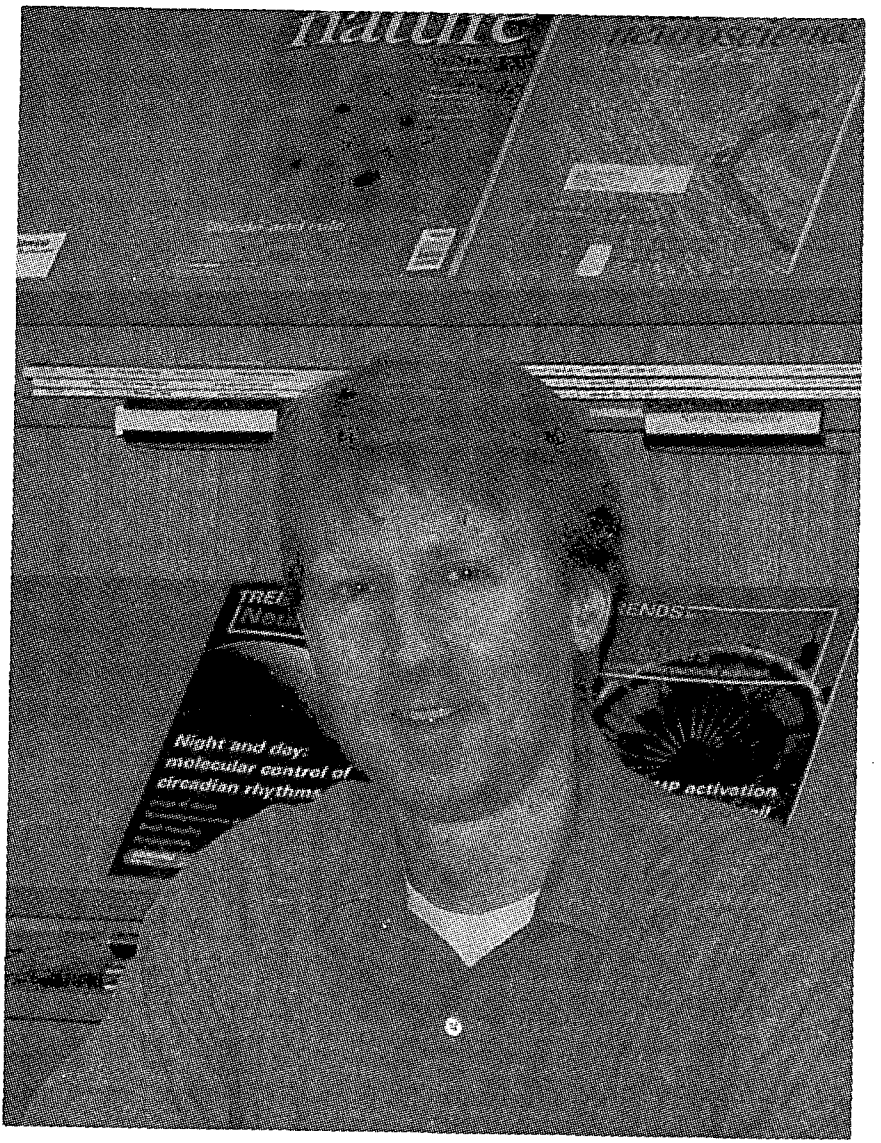
down the first line. After the elements are worked out, he makes sure everything makes sense. Characters must behave rationally, given their circumstances, and what happens can be reasonably expected. And yet, as Ron Hubbard told in a classic story in this magazine, characters may run away with the story and the author gets to an unexpected ending. Kyle shouldn't be surprised at this, since after all, a neuroscientist should know that his brain has a mind of its own. *Analog* readers should look forward to more intriguing stories influenced by the Good Doctor and Dr. K.'s subconscious. ■



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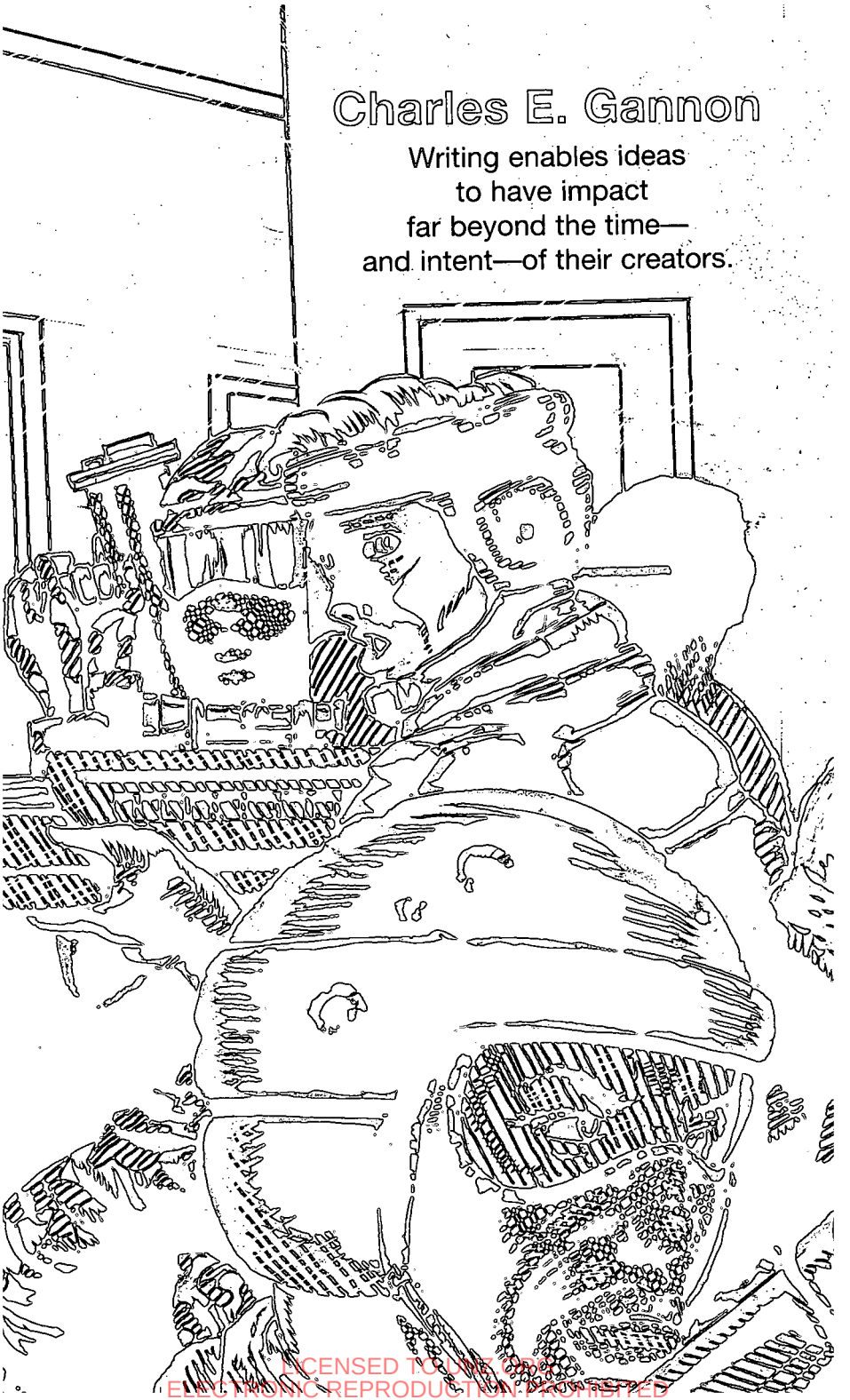
Charles E. Gannon

Writing enables ideas
to have impact
far beyond the time—
and intent—of their creators.



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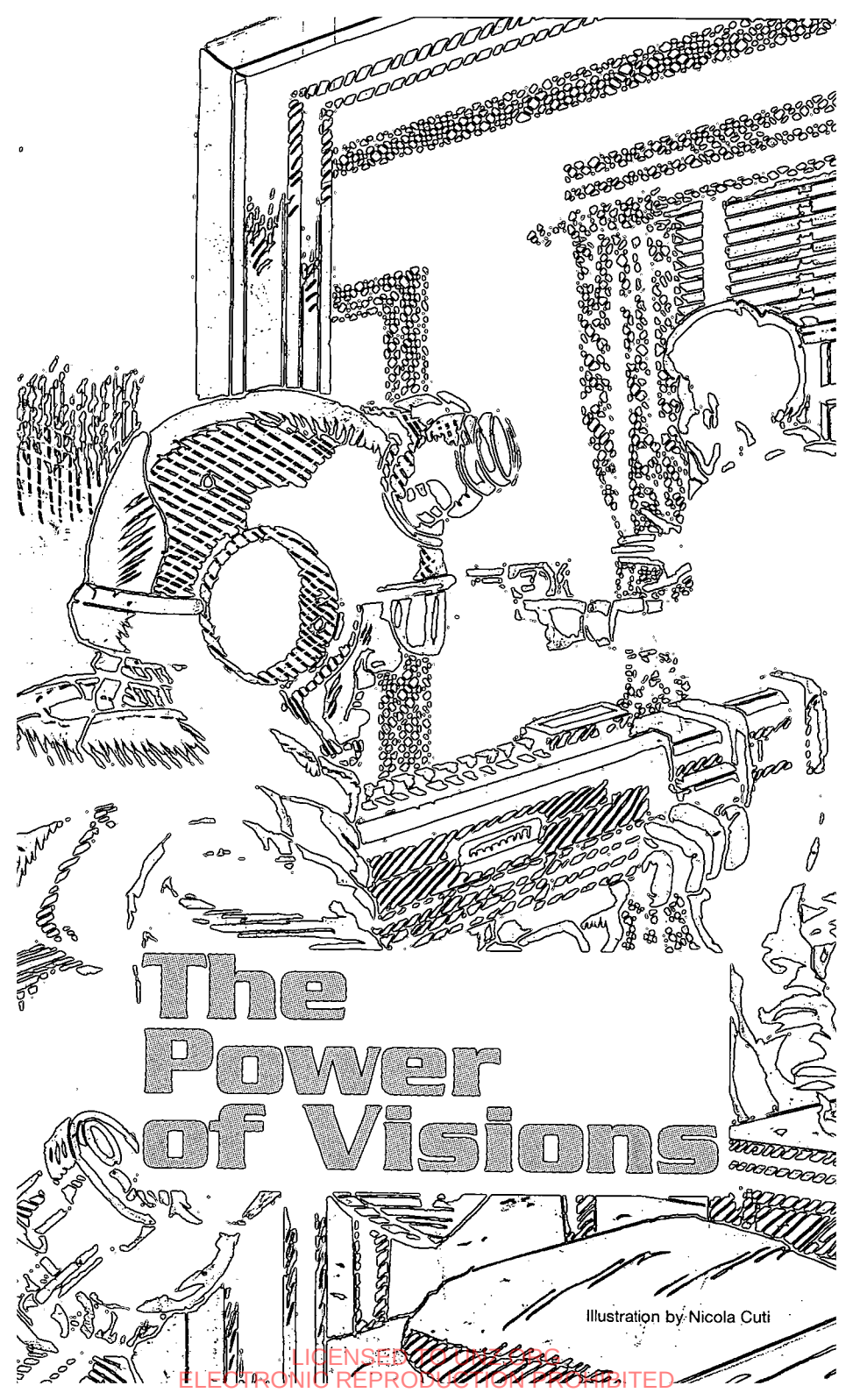

The Power of Visions

Illustration by Nicola Cuti

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From his vantage point at eighty meters altitude, Wilder saw the Chrysler Cargomax's front left tire blast apart, streaming black tatters. The boxy van—a new hydrogen-oxygen fuel-cell model—lurched, swerved, slewed around to a broadsided stop in the middle of the road. Wilder slowed his government-issue aircar; the whine of the lateral thrusters faded, the growl of the verticals increased. The aircar dumped velocity, shuddering into a slow forward crawl.

Chu—a greenhorn field agent straight from Quantico—looked up. "Something wrong, Colonel?"

Wilder nodded at the Cargomax as they passed over. "Blow-out—but a damned odd one. Tire went flat too fast. See if you can raise Security back at Picatinny; maybe they've—"

The commo pager toned once, twice: incoming message on a secure channel. Chu raised a hand to his headset, toggled open the circuit. A wash of static was supplanted by: "Juliet Delta Bravo Niner, this is Picatinny Security. Be advised: real-time analysis of local ambient audio indicates possible gunfire, your current sector. Repeat: possible—

Chu interrupted. "Negative, Picatinny: not gunfire. Have observed truck with single tire blowout. Repeating: not gunfi—" and then Chu stopped; Wilder was accelerating, pulling the aircar into a tight, about-face loop. Chu took his hand away from the headset. "Colonel?" he asked, "Is something—?"

"Relay the truck's coordinates to Security, Mr. Chu." Wilder's eyes were back on the truck as they swung to reapproach it. "Security's right about the gunfire. That tire didn't blow out; it was shot out. That's why it flatted so fast. And given our proximity to the fusion reactor complex, I wouldn't be surprised if—"

The Cargomax's rear doors swung wide; two tongues of stuttering brightness licked out of the dark maw of the cargo bay. Considering the conditions, the marksmanship was impressive: two rounds of six-millimeter caseless drilled into the aircar's fuselage. The rest of the autofire spray went wide and low.

Chu gripped his seat's armrests. "Shit!"

Wilder accelerated, climbed, banked hard, came around for another pass. "Relay the coordinates," he repeated as he leveled off and activated the nose cameras—which began tightbeaming directly to Picatinny Security and uplinking to the Pentagon. The muzzles of two assault rifles stared up at them, elevating slightly as they tracked the approaching aircar. Wilder grimaced: being shot at by terrorists had not been on the day's agenda.

Darryl Wilder had been looking forward to turning in his Acting Special Investigator badge and catching the Singapore hypersonic from JFK; he was going to spend the entirety of his four-week furlough with Mei Lei—both because he wanted to and because she would give him holy hell if he spent any of it anywhere else. But good manners—both the personal and interservice varieties—demanded that he and Chu have a drink and a dinner first. Not an entirely unpleasant prospect; Cory Chu was a nice enough kid—a first generation son of Sino-Filipino refugees from the Metro-Manila Famine of '23—and had been an indispensable aid in setting up the Picatinny Fusion Reactor's integrated security, air defense, and antiterrorist systems. On the down side of the human equation, Chu lived, breathed, and defecated the glories of the Bureau—and repeatedly goggled at Wilder's supposed celebrity. Cory's first fascination was—predictably—with Darryl's piloting experiences in the Highground war (Chu insisted on referring to these as "exploits"). But just this morning, the fusion project's security coordinator, Chief Portabaco, had let it slip that this wasn't Colonel Wilder's first detached duty assignment to the FBI: when still a First

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Lieutenant, he had been attached to the Bureau during its investigation of the most infamous terrorist attack of the century.

Chu waited until were they climbing into the aircar to broach the topic. "I understand you knew some of the agents who tracked down the perps in the Buffalo Bombing."

"No, Mr. Chu: I *was* one of the investigators." Wilder finished the preflight checks, brought the L-hyd thrusters online; the pre-burn warning tone shrilled at potential bystanders. "It was a very educational assignment—but not very pleasant."

"A real piece of history, though. No one thought that such an attack was possible after the 9-11 crackdowns."

Wilder sighed, swung the aircar around for departure. "Being a part of history is overrated, Mr. Chu. There was no excitement, no glory: just the rage and panic caused by the destruction of half a city, and the dirty job of bringing the perpetrators to justice—those which we could find, that is."

"I remember; you had a hard time positively identifying the terrorists."

Darryl nodded. "The covert counterstrikers in Lebanon and Libya were pretty 'liberal' about targeting."

"Did you go on any of those raids, Colonel?"

Wilder shook his head. "No, I'm happy to say that I've neither shot—nor been shot at by—terrorists, Mr. Chu. And, if I get my wish, I never will be."

Ironically, that's when Wilder first spotted the truck.

Figures were jumping down from the rear of the Cargomax as the government aircar swooped closer to it. Chu swallowed loudly. "Colonel, why not let Security take care of this?"

"What? And deny you the opportunity to be a part of history, Mr. Chu?" Wilder nosed the aircar down, closer to the treeline, but kept its cameras trained on the truck. "Besides, every second may count, now."

Evidently, the intruders were also aware of the importance of time; a pair of them hopped down from the trailer and unloaded a large tubular object. Chu drew in a sharp breath. "AA rocket."

Wilder narrowed his eyes; the tube was too bulky for a man-portable SAM. Which meant that it had to be—

"Chu: ETA on the Security verticals?"

"Uh—standby attack sleds are sixty seconds out, troop carriers at eighty."

Not soon enough. The two figures with the tube were already sprinting toward the reactor complex—sprinting much faster than was possible for unaugmented humans: probably genetically enhanced, with an extra boost from some black market cyberartist in Kyoto. If those two ever got a shot at the reactor complex, they would not miss, and judging from the terrain, their rocket might get under the firing arc of the air defense grid's point-defense weapon system.

"Mr. Chu, those two men are not carrying a SAM."

"Then what—?"

"Probably a fire-and-forget tactical missile with an enhanced warhead—possibly a tac-nuke."

"But when they launch it, the Point Defense Weapon system will—"

"—will never see it; a ground-skimming rocket's too low for the system to intercept, given the terrain."

"Meaning—?"

"Meaning we take care of the rocket the old-fashioned way. Keep a camera on them and tell Security to intercept ASAP." *And still,* thought Wilder, *that won't be fast enough; those two runners will reach a suitable launch site before the attack sleds arrive, unless—*

Wilder brought the aircar around hard: the vehicle's frame shuddered as the forward jets gimbaled into a screaming retroboost attitude. The nose swung in the direction of the two-man rocket team and Wilder pushed the jets to maximum thrust—just before he glanced

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back at the truck.

As if on cue, another two-man team emerged from the cargo bed, carrying a narrower tube, this one bristling with numerous angular outcroppings: a SAM launcher with integral guidance systems. A draw play: get the attacking pilot's attention focused on your own primary attack team, then bushwhack him when he's not looking. Wilder smiled: *But I was looking.*

A plume of white smoke roiled out of the rear of the SAM launcher. The missile arced toward the aircar—and Wilder slammed the vehicle into a power dive. The craft plunged into a lightly wooded ravine and broke out of the dive at ten meters altitude. Behind, the SAM shot over and past the ravine, then started up into a broad, high loop as it attempted to reaccess its target, its lookdown sensors searching for the aircar. Wilder watched it climb—*just a little higher, you bastard*—and then the missile disintegrated into a cloud of minute fragments.

"Point-defense weapon systems confirm one SAM destroyed," announced Chu.

"And not a moment too soon. Now; call in an airburst barrage on the truck's coordinates—non-lethal munitions only."

Chu turned, his eyes wide. "Sir? There's a residential zone within half a kilomet—"

"Just do it," snapped Wilder. "If Security doesn't interdict the SAM team before they fire another missile, this could be a very long—and bloody—business." Wilder boosted up out of the ravine, spotted the first team, and swerved toward them; they had stopped running and were preparing the rocket for firing. Wilder watched the gunner's assistant pop off the rear blast cover and hurl it away like a Frisbee. He heard himself ask, "Security's ETA on the first team?"

"Ten seconds, Colonel."

Not soon enough, thought Wilder—who pushed the thrusters to maximum just as the rocket gunner hefted the tube onto his shoulder and swung the weapon toward the reactor complex four kilometers away.

The rocket team must have heard Wilder's aircar screaming down behind them, but they had extraordinary discipline. The gunner never turned, and the assistant spun around only at the last second, unloading a full clip of six-millimeter caseless at Wilder and Chu. Several rounds hit the fuselage, blasting out the nose cameras and a forward thruster as the aircar screamed over the terrorists at 250 kph—and at only four meters altitude. Wilder hauled back on the controls, pivoted the jets. Too busy to look himself, he asked, "Chu, did our airstream drop them?"

Chu blinked, shook his head. "Barely a stagger."

Wilder wrestled the aircar into a hover, damning the *yakuza* enhancement specialists who, for the right price, were creating terrorists who were steadier, faster, and stronger than humans had any right to be. Wilder spun the controls, turning the aircar to face the rocket team—thereby placing it directly in their line of fire.

Chu looked out the cockpit canopy—and found himself staring down a fourteen-centimeter rocket tube. "Sir—?" he began.

The rocket gunner bounded to the left, hefting the weapon as if it were made of balsa wood. Wilder yanked the controls over, tracked with the enhanced human, who, finding his line of sight blocked again, cursed—just as a sudden roar of high-speed rotors obliterated all other sounds. Chu, hand to his headset, started with, "Colonel, the attack sleds—"

"—are here and we're leaving," Wilder finished. He fired the verticals. The rush of displaced air rocked the terrorists back one half step—just as two tiltrotor attack sleds came yowling over the treeline, their chin-mounted chainguns spewing tracer-bright streams at

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the terrorists. From his rapidly climbing perspective, Wilder saw the gunner re-steady himself—and then discorporate into an erect red smear, the mauled rocket launcher cartwheeling away through the underbrush. The attack sleds were already swiveling their weapons after the fleeing assistant. Wilder juiced the lateral thrusters; the aircar arrowed back toward the disabled truck, away from the grisly—and abrupt—end of the remaining terrorist's attempt at escape.

Wilder and Chu arrived just as the first troop carriers were landing at the edge of the truck-centered bombardment zone. Security troops—sealed in semi-rigid armor—dismounted into the periphery of the barrage. The terrorists rose up from covered positions, firing blind through swirling drifts of riot gas and the airbursting cluster bomblets, the latter spraying tranquilizer gel beads instead of shrapnel. Several troopers responded by kneeling, calmly adjusting their thermal imaging goggles, aiming, and firing: terrorists sprawled backwards. Wilder boosted higher; no need to watch the carnage.

Chu swallowed, croaked. "Looks like it's pretty much over."

Wilder looked at Cory from the corner of his eye. "Mr. Chu, this incident is far from over."

"Sir?"

"The turkey shoot we just witnessed is not the day's most important example of small arms fire—only the most dramatic."

Chu nodded, remembering and understanding. "The first shot—the one that took out the truck's tire."

"Exactly. That's the shot I'm most worried about."

"Why? If it wasn't for that shot, the terrorists might have been able to get close enough to launch their rocket, and that—"

"—That could have meant the destruction of the reactor. Yes, we had a good outcome—but without any good explanation. Why does some anonymous tire-shooting sniper want to foil the terrorists and yet *not* be willing to reveal himself to us? That, Mr. Chu, is what bothers me; I want to know the sniper's motive before I start sending him 'thank you' letters. Any information on the terrorists yet?"

Chu put his hand to the headset. "No, sir. Security is still sweeping the area for possible escapees or accomplices."

"Contact the command post back at Picatinny; tell them I want ethnographic analysis on the terrorists ASAP. Then put in a priority request to the Pentagon; I need them to release a sky-eye for continuous observation of all air and ground movement within a fifty-kilometer radius of this site."

"But, sir—"

"Use my authorization code—and don't say 'please' when you tell them you need a low-orbit bird; it's an order, not a request." Wilder plotted a circular flight plan that would eventually spiral the aircar out to a point fifty-five kilometers from the reactor complex. He turned the job of executing the plan over to the computer, and then called up a *faux* 3-D topographical image of the Picatinny region. Wilder shifted the image until it was centered on the truck's location. The electronic terrain now matched their surroundings: gently rolling hills—cleft here and there by a sharper ridge-line—rose from shallow, lake-cradling vales. Nearby towns—Mount Hope, Hibernia, Lake Telemark—disrupted the smooth waves of the landscape, troubling it with angular, upward-pointing fingers of progress: hotels, office complexes, and a few antique water towers. Somewhere in that scene, perched upon one or another pixel of virtual topography, was the sniper's vantage point—and their key objective. A vast search area, but the known forensics of the event—combined with the tactical requirements imposed upon the sniper—provided

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Wilder with the means of narrowing the possible locations.

To begin with, first-round accuracy had been essential, so the shooter was not likely to be more than 3500 meters away: Wilder reduced the image to a three-point-five-kilometer radius around the truck. He paused, considering, then keyed in more limiting parameters: identify those locations which had an unobstructed line of sight to the truck, and exclude all areas within 500 meters. The shooter would want distance between himself and the first response forces. The computer hummed for a fraction of a second, and then shaded the upper reaches of about a dozen buildings and ridge lines in bright orange: possible vantage points for the sniper.

Wilder frowned; still too much ground to search in the time available. How to proceed? See it from the sniper's viewpoint: what was the key to stopping the truck? First-shot accuracy. That meant the sniper needed to see the truck for a few seconds before firing—enough time to aim at and track the tire that was his target. And that meant—

Wilder selected only those vantage points that also offered a clear line of sight to the seventy-five meters of road that the truck had driven over prior to the shooting. The computer hummed again, and then wiped away almost all of the orange highlighting—except for three small patches: the top of a building in Hibernia, an old water tower to the south, and a ridgeline to the north. Now, if only—

"Colonel, I just got confirmation from the Pentagon; your bird is on-line and looking down."

"Good. Submit a top-priority request for tight analysis of these three sites." Wilder downloaded the coordinates into Chu's console. "Tell them to look for any unusual transport activity: high-speed ground vehicles, unlogged aerial transports or violations of vector assignment, even pedestrians who keep running for more than a minute or two. If our shooter is in a hurry to leave the area, I want to know about it."

"Yes, sir. And sir—"

"Yeah?"

"Picatinny security on secure channel, sir."

Wilder sighed: *That will be Chief Portabaco—who's probably as pissed as hell.* He opened the channel. "Hello, Chief."

But instead of Portabaco's anticipated *basso profundo* tirade, there was a half second of silence. Then: "Colonel Wilder, this is Assistant Director Simmons, National Security Agency."

Wilder clamped his molars together. *Now this just makes my day.* "Mr. Simmons, excuse my surprise, but I was expecting to talk to Security Chief Portabaco."

"I realize that, Colonel, but inasmuch as I'm the reactor's covert Federal overseer—"

News to me, thought Wilder.

"—I thought it better to exercise my command prerogative for the duration of this crisis—particularly when Chief Portabaco's security forces initiated an indirect fire mission."

Wilder sighed. "They were doing so on my orders, Mr. Simmons."

"Yes, I'm aware of that, Colonel—which is why I felt it necessary to step in. I appreciate that you're used to—how should I put it?—'military' solutions, but we *are* located in the middle of a residential—"

"Mr. Simmons, with all due respect, I called for an indirect fire mission in order to *protect* civilians, not to endanger them."

"How do you figure that, Colonel?"

"There is a distinct possibility that the truck was carrying a back-up tactical rocket, and that one—or both—rockets were dirty tac-nukes: low yield, but capable of producing extremely intense radioactive contamination. That would not only have forced us to shut down the Picatinny project, but could have caused hundreds of civilian casualties."

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"An interesting hypothesis, Colonel—but quite wrong. Security has reported no back-up rocket in the truck, and the one that was interdicted by the attack sleds was equipped with a standard penetrator warhead; no contaminatory capacity whatsoever. Indirect fire was *not* called for."

"That's easy to say in hindsight, Mr. Simmons."

"Well—that's for a board of inquiry to decide. Personally, I feel that your response to this situation has been rather precipitous."

Wilder closed his eyes. *Precipitous*: that was one of the "in" words used by the more stylish spooks. Wilder paused until he could be sure of a level tone of voice. "Mr. Simmons, I stand by my actions without reservation. Our orders regarding the defense of the Picatinny complex are to always assume a worst-case scenario."

"In which case you should simply have let the point-defense weapon systems handle the situation. Those systems are specifically designed to intercept tactical missiles."

"Yes, Mr. Simmons, they are—assuming they have enough time to access and lock on to their target. If you look at the path the missile would have traveled from its launch point to the reactor complex, the first two-and-a-half kilometers are entirely obscured by trees. The rocket would have been traveling through the equivalent of a protective tunnel—and we had no defense batteries covering the end of that 'tunnel'."

Simmons was silent for a long moment. "Why not, Colonel?"

"Mr. Simmons, if you'll check my confidential recommendation to the Joint Chiefs"—*And I'm sure you already have, you weasel*—"you'll find that I not only asked for a doubling of the PDW perimeter defenses, but for the clearing of all obstructions within three kilometers of the reactor complex. Now if it's all the same to you, I've got a job to do."

"Which is?"

"Locating the first shooter while he's still in the primary search perimeter. Has Security submitted a preliminary ethnographic report on the terrorists yet?"

"They have; Middle Eastern. We have evidence suggesting multiple national origins throughout the Pan-Arab sphere: Syria, Yemen, Iraq, possibly one from Saudi Arabia. My guess is that your unidentified sniper is a Western sympathizer—probably a defecting Pan-Arab terrorist hoping to get an asylum deal in exchange for this 'good deed' of his."

Christ, Simmons: you read too many spy novels. Aloud: "I have to disagree with that conclusion, Mr. Simmons. Your own agency's latest reports concur with the CIA's: the Pan-Arab Alliance is aggressively screening its own covert operatives now. These aren't your garden-variety terrorists anymore, Mr. Simmons. They're well-trained, well-equipped, well-paid, and—above all—extremely disciplined and loyal, so I don't think we can assume that it was a defector who shot out the truck's tire."

"Then what is your hypothesis?"

"I don't have one yet, Mr. Simmons—which is why I'm very eager to capture the shooter." Chu waved for Wilder's attention. The young field agent pointed to the sky and nodded: the satellite was on line. Wilder returned the nod. "Mr. Simmons, we have real-time downlink images from a dedicated sky-eye. I'd like to relay them to your computers for analysis."

Simmons paused a moment. *Probably calculating exactly how much political clout I have, since I got a sky-eye on a minute's notice*, Wilder hypothesized. Simmons's gracious reply confirmed that hypothesis. "Certainly, Colonel. I'll be glad to oversee your efforts from my CP."

"Oversee" my efforts? Wilder smiled humorlessly at Simmons's surreptitious assumption of command. *Think what you want Simmons—but don't hold your breath waiting for me to take your orders.* But what Wilder said was:

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"I appreciate your help, Mr. Simmons. We have three high-priority queries in the pipeline with the Pentagon now. I wonder if you could update us when the responses to those queries come in?"

"Of course."

Wilder closed the channel, leaned his lower lip against the knuckle of his index finger; determining the shooter's vantage point wasn't going to be enough to ensure the sniper's capture. That would require—"Mr. Chu, I need you to initiate another set of inquiries with the Pentagon."

Chu looked sideways at Wilder. "Sir, if Mr. Simmons outranks you, doesn't he have every right to expect that any further communications with the Pentagon will be routed through him?"

"Yes, Mr. Chu, he does have every reason to expect that. But that's not what's going to happen. Do you understand, Mr. Chu?"

"Yes, sir."

"Good. After you've opened a new secure channel to the Pentagon, request a listing of all local accommodations rentals transacted within the past three weeks. Restrict the list to hotels, houses, and apartments within a thirty-kilometer radius. Any anomalous transaction—questionable identification papers, foreign nationals, unusual payment method—should be flagged and included in our primary database."

"Sir, are you aware of the number—"

"I am aware, Mr. Chu, that every second you spend complaining about the magnitude of the task is a second that you are *not* spending completing it. Once you've isolated the anomalous transactions, you'll need to get the complex records for each rental—"

"Colonel, the Supreme Court—"

"—often looks the other way when it comes to matters of national security. But you never heard that from me, did you, Mr. Chu?"

"Uh—no, sir."

"Good. Scan the communication records for any unusual calls: embassies, rentable voice mailboxes, the homes of foreign nationals or recent émigrés—particularly those from nations belonging to the Third World Coalition."

Chu stared at Wilder. "Begging your pardon, sir, but the time required to construct that kind of discretionary database would be prohibitive."

Wilder looked at Chu from the corner of his eye. "That's right, Mr. Chu—unless such a database *already* exists."

Chu blinked at the meaning implicit in Wilder's words: that such flagrantly unconstitutional data sorting operations were routine. "And how do I initiate a request for this 'hypothetical' database, sir?"

Wilder nodded. "A suitably oblique choice of phrasing, Mr. Chu; I see you have a future in this line of business. When you contact the Pentagon, simply be specific about all your information needs: specific, *not* oblique. Do you understand, Mr. Chu?"

Chu nodded tightly and opened a secure channel to the Pentagon just as the other secure channel—the one to Picatinny—toned twice.

"Wilder here."

Simmons' voice suggested a bit more respect, perhaps even a hint of cordiality. "Colonel, we've double-checked and confirmed the Pentagon's sky-eye analysis of the shooter's three possible vantage points. We can eliminate the ridgeline to the north. That site is a slate surface which remains in the shadow of overhanging trees until late afternoon—and there are no signs of thermal abnormalities. Meaning that it's been at least two hours since any sizable mammal—including a human—has been on that ridge."

"What if the sniper had been in a sealed suit, with a chill-can to mask IR emissions?"

"Not likely. A man equipped that way would be moving awkwardly; he would have been almost certain to show up on the pedestrian movement scan that you

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requested."

"*If* he's moving. But what if he's lying low, still in the vicinity?"

"Negative. Sky-eye sensors ran a spectrographic check for aerosol elements consistent with concentrated chill-can emissions. No signature in the entire area."

Well, at least Simmons was thorough. "What about the other two sites?"

"Nothing conclusive. But I'm betting on the water tower."

"Why?"

"The hotel is too public: not the kind of environment favored by snipers. On the other hand, the water-tower is an old, isolated, all-metal construction, and by this time of the day—"

"—the sun has heated it up to the point where any biothermal traces will be obliterated. Good point, but what about the surrounding area? Traces of recent vehicle departure? Individuals moving away on foot?"

A pause. "So far, nothing—but I'm sure the tower's our best bet." Then, a subtle change in Simmons' tone: less conversational, more measured. "I've been informed that the Bureau has three special tactical agents inbound via high-speed vertical; link up with them and check out the tower."

There it was: Simmons' inevitable attempt to assume command—piggybacked on a stupid order, no less. Contrary to Simmons' assessment, the hotel was the more likely—if less obvious—vantage point. If the sniper had been smart enough to use a weapon that fired caseless ammunition, the sound would have been minimal; caseless weapons had sealed actions, and therefore, no secondary gas venting or bolt chatter. When equipped with a silencer, they were virtually noiseless—except for the downrange crack of the supersonic projectile. Consequently, the sniper's shot would not have been heard by hotel guests—and the crowded environment of a hotel was perfect for the shooter's purposes: cluttered with innocent bystanders, plenty of places to hide, and lots of opportunities to disappear into a crowd. Conversely, in the open, and on his own, the sniper would be an easy—and obvious—target for security sweeps.

Simmons' tone suggested impatience—and uncertainty. "Colonel, please respond; what is your ETA to the water tower?"

Chu swiveled around, shook his head vigorously. Wilder muted the link to Simmons. "What do you have, Mr. Chu?"

"Preliminary results on the rental transactions. Maybe nothing, but—"

"Just the bottom line. And right now."

Chu complied without stopping to breathe. "One major anomalous transaction. In the past week, only one of the rentals in the area was paid for in hard cash—and I mean actual, physical cash—"

"I get the picture; just about the only kind of purchase that still doesn't involve an automated ID check. Who made it and where?"

"A 'William Anderson', room 1257 at the Hibernia Regency—the hotel with the vantage point."

Wilder brought the aircar over hard, pushed the thrusters to maximum, giving orders as he drove. "A team of tactical FBI agents are in the area. Get in contact with them and tell them to meet us at the Regency. No sirens, no vector clearance broadcast: silent approach."

"What about Simmons?"

"What about him?"

The three special tactics G-men—plainclothes Feds with the physiques of Kodiak bears—eyed Wilder's aircar as it settled onto the hotel's landing tarmac. As the gull-wing doors rose up, the smallest of the three—a midget at six feet—ambled over and used his index finger to play connect-the-dots between the bullet holes that were arrayed across the aircar's front left quarter-panel. "Busy day, sir," he observed. "I'm Agent Kinelea. What's the drill?"

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Wilder walked toward Kinelea's vertical. "We have one or more suspected snipers—and possible terrorists—in room 1257. We need them—or him—alive. You have any non-lethal suppressives?"

Kinelea shook his head, leaned into the vertical, produced a long, black case. "'Fraid not, Colonel. We're loaded for bear." He grazed his thumb across the case's fingerprint reader, popped the clasps and threw back the cover: a thick-bodied rifle lay in a gray foam cradle. "Eight-millimeter binary-propellant assault rifle. State of the art."

Wilder reached in, picked up the weapon, turned to Chu. "Have you ever used one of these?"

Chu, staring at the long snake-lick of a barrel, nodded, then frowned. "I think so, but the one I fired didn't have this." He pointed at a small LED panel at the rear of the rifle's action.

"Integrated laser rangefinder and arming distance indicator. Essential when you're using this"—Wilder patted the three-centimeter grenade launcher under the barrel—"because the LED not only shows the range to the target, but the arming range of each grenade. Handy, since different types of grenades have different arming ranges." Wilder returned the weapon to Kinelea, glanced at Chu. "You've notified the hotel management?"

Chu nodded. "As per our request, they're ready to suspend elevator operations and isolate the twelfth floor."

"Okay, then let's pass out the party favors and get moving."

Kinelea nodded, reached into the vertical, grabbed two more of the long black cases. The largest of his partners emerged from the rear of the aircraft, carrying two KevlarMax high-threat entry suits. When Chu saw the armor, his eyes widened, then scanned Wilder's face for a reaction.

Wilder nodded, tried to muster a grin as he shouldered his way into the bulky garment. "Try it on, Chu. Think of it as a fashion statement."

The four of them—Wilder, Chu, Kinelea, and one of the other FBI heavies—took the last functioning elevator to the eleventh floor, then moved quietly up the stairs to the twelfth. Kinelea opened the fire door and leaned his eye into the narrow aperture.

"All clear," he muttered. Then, into his collar mike: "You set, DePranza?"

DePranza's voice came in over the group channel; the throaty hum of the hovering FBI vertical was audible behind his words. "I'm on low-power fans, four meters over the roof, ready to interdict the target's window."

"Make sure you don't miss your cue; I want to be able to wave at you as soon as I get into the perp's room."

"Yeah, yeah. Get going."

Kinelea turned to Wilder. "You ready, Colonel?"

Wilder checked his rifle: full magazine, laser designator on, three grenades—unnecessary in here—in the launcher's magazine. He adjusted the sling so that the weapon rode about an inch below his hip: just enough slack to help absorb the recoil. But if everything went according to plan, that adjustment would be an unnecessary precaution; the objective was to take the perpetrators without firing a shot. "Let's go, Mr. Kinelea, and remember: no shooting, if at all possible."

Kinelea nodded, leaned a shoulder against the fire door. "Here we go." He leaned harder; the door swung open—and Kinelea rolled with it, trotting into the corridor that led away from the staircase. Leapfrogging past each other, the four of them reached room 1257 in somewhat less than twenty seconds. There, Kinelea produced a fiber-optic snooper about the size of a palmtop and began easing a spaghetti-thin probe out of the top of the unit. He snaked the almost hair-thin fiber-optic probe under the door. After a half second of static, a picture resolved on the unit's LCD

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screen, bracketed on either side by a column of virtual buttons. The image was that of a typical hotel suite: dresser, lamp, fractionally-seen double beds, a reading chair—and a six-millimeter caseless assault rifle, fitted with a silencer, leaning against the wall next to the windows.

"Bingo," whispered Kinelea. "But where's our boy?"

"Check for thermals," suggested Wilder.

Kinelea nodded, touched one of the screen's virtual buttons. The picture flickered, became a moiré of blues and greens, the windows transforming into vague polygonal orange masses. Less spectacular—but infinitely more important—was the faint pink haze that emanated from the bathroom and led deeper into the suite, where it disappeared around a corner. Wilder pointed to the slowly dimming haze. "There."

"Yup. That's our boy. Left the john about thirty seconds ago, I'd guess. Alone too, I think."

Chu peered over Kinelea's shoulder. "How can you be sure?"

Kinelea's response was half-grunt. "I didn't say I was sure—but if there were other people in the room, their movement would tend to leave overlapping thermal smudges."

"And if they're asleep—or out of sight and not moving?"

Kinelea removed the probe from under the door, turned and stared at Chu. "Then we'd better step lively and shoot straight. Shall I do the honors, Colonel?"

Wilder avoided looking at the G-man's bluff, ready face, focused instead on the rifle in his hands. Kinelea seemed competent but too ready to get into a straight-up fight—and Wilder could not afford that kind of mess. So Kinelea's actions had to be controlled. Wilder looked up sharply: "Mr. Kinelea, you lead us in and secure the bathroom. I'll follow you and secure the bedroom."

Kinelea stared for a moment, then shrugged. "It's your show, Colonel. Say when."

Wilder nodded. "'When.'"

Kinelea swung his weapon in close to his body, snapped the safety off, and reared back. "DePranza," he whispered into his collar mike, "go." He launched himself at the door.

A short, sharp squeal of deforming metal—and then the door swung wide. Kinelea entered with a bearish bound and a shuffle step to the right: rifle lowering, he slid around the corner into the bathroom—which was empty, as both he and Wilder had known. Wilder took two long, deerlike steps past Kinelea, searching for the sniper, who had to be—

In the center of the bedroom, a single dark figure was just completing a turn away from Wilder and toward the expansive picture window—that had just begun to vibrate. With a roar that shook the glass, the FBI vertical dropped down to block the view. The dark figure turned calmly back to face Wilder; there was an old revolver hanging in his right hand.

Wilder snapped his rifle down, tucked its pistol grip into his right hip. "HALT! Drop your weapon and turn around." Wilder saw a smile play at the corner of the sniper's mouth, saw amusement ruffle his light-chocolate brow; he had understood the command—and had no intention of complying. Not good. In another moment, the agents, and even Chu, would be arriving—nervous, and possibly trigger-happy. Wilder reiterated his command; "Drop your weapon—*now*."

In response, the man—young, handsome, athletic—smiled and began raising his revolver—very slowly. *Too slowly*, Wilder realized. The bastard *wants* us to kill him—which means that it's all the more essential that we *don't* kill him. But how? Shoot out a leg? He could die from the shock—and besides, once I start shooting, there's no telling who else—Wait: there *is* another option.

Wilder snapped the selector switch

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beside the trigger; the gun was now primed to fire grenades. A quick glance at the LED panel behind rear sight gave him the other two pieces of essential data: the laser rangefinder placed the target at five meters; the grenades showed a minimum arming distance of ten meters. Perfect: at this range, the grenades were just slow—but very big—slugs. Wilder tucked the pistol grip all the way into his hip, dropped the muzzle a few inches, jogged it to the left. The bright red dot of the aiming laser zipped down toward the lower right side of the sniper's chest—

Wilder squeezed the trigger. The throaty cough of the grenade launcher took everyone—target included—by surprise. The three-centimeter projectile slammed into the grinning gunman's lower right ribcage, jackknifing him at the waist and hurling him over both beds. He crashed into the night table in the far corner of the room—unconscious, blood already bubbling out between his lips—but very much alive.

Ignoring Simmons' arctic stare, Wilder accepted the microdisk from Chu, slipped it into his palmtop, and scrolled through the pre-interrogation briefing. Estimated age of prisoner: 29-30. 172 centimeters tall, 73 kilograms, brown eyes, black hair. Analysis of body oils, dental and osteological development, skin weathering, muscular development of oral structures, and dialect analysis of his terse responses to Simmons' post-operative interview questions pointed at coastal Lebanon, possibly Syria. The shooter's photograph was not on record with any intelligence or law enforcement agencies, nor were his fingerprints, retinal patterns, or DNA code. There was no evidence of genetic or cybernetic enhancement, although his physiognomy indicated regular exercise and intensive hand-eye coordination training. Other than four broken ribs and a punctured right lung, the prisoner was in excellent physical condition.

Simmons' voice was even colder than his eyes. "I suppose you're aware that I objected to your participation in the debriefing process."

Wilder nodded. "I seem to remember hearing something about that yesterday, when you had me barred from the prisoner's hospital room. But now it looks like we're going to have to work together, after all."

"Perhaps, but I'm not joining you on another anti-Arab witch-hunt, Colonel. It's sad to see that you can't put the—how shall I say it?—the 'incomplete results' of the Buffalo investigation behind you: I think it's blinded you to the fact that many—even most—Arabs are our friends."

Wilder frowned. "I'm not blind at all, Mr. Simmons. I know that much of the Arab world is well-disposed toward us. But I also know that when you first spoke to this shooter, you assumed that he was our ally—scared and evasive perhaps—but our ally. That assumption must be challenged."

"Why? So you can antagonize him by trying to connect him to some convoluted Arab plot?"

Wilder shook his head. "You weren't there when we took him down, you didn't see his behavior. He was ready, almost eager, to die—which means that this shooter isn't some scared defector; he's a man who is very dedicated to a very specific mission."

"And what would that be?"

Wilder shrugged. "I don't know—yet. That's what we're here to find out."

"*You're* here to find that out, Colonel. I'm here to observe—and just between us, I think you're seeing ghosts from the Buffalo Bombing."

"Maybe I am, Mr. Simmons—but I don't think so. Tell the guards to bring in the prisoner."

Simmons picked up the phone, muttered a single syllable. The door opened, admitting two security guards and the shooter. His dark brown eyes—cautious

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and alert—swept the faces in the room, stopped when they encountered Wilder. The prisoner's almost-buckled brow straightened, and then rose: a precursor to a smile. Wilder nodded at the man. "Since you obviously recognize me, I suppose you also realize that you can drop the defection charade. I'm not going to buy it, Mister—?"

"Ali. Call me Ali."

"Very well, Mr. Ali." Wilder glanced at Simmons, who was trying to look neither surprised nor angry. "Please have a seat."

Ali was smiling openly now. "Thank you."

Wilder remained standing. "Mr. Ali, it would be easiest for us all if you'd simply tell us who you're working with."

Ali carefully avoided meeting Wilder's eyes. He cleared his throat, murmured, "I do not see how it could possibly be in my interest to provide you with any information."

"Please Mr. Ali, let's not play games. You want to be incarcerated here in the U.S.—locked up and hidden away in the deepest, most secret cell we have—because then you won't be interrogated by Saudi and Iraqi investigators. That's what you're really trying to prevent, isn't it, Mr. Ali?" The shooter sat very still, his eyes forward and unblinking. "End of the game, Mr. Ali. Now all that's left is the truth."

"Which is *what?*" Simmons barked.

"Which is that Mr. Ali is motivated by power, but not power of a secular order. Mr. Ali and his compatriots are not seeking national or economic or even cultural power: they are fighting to restore divine power. Their struggle is not merely with us, but with anyone who no longer recognizes the supremacy of Allah's will."

The shooter—eyes still straight ahead—lifted his chin and spoke:

"If Allah had so willed,
Succeeding generations
Would not have fought
Among each other, after
Clear signs had come to them—"

Wilder completed the verse:

"—But they chose to wrangle
Some believing and others
Rejecting the visions."

The shooter turned sharply toward Wilder, his brow lifted in surprise. "You know the Qur'ân?"

Wilder nodded. "I do. You're quoting the amended Yusufali translation, if I am not mistaken. That passage is from *Surah* 2, *Ayat* 253."

Simmons shook his head. "'Surah'? 'Ayat'?"

"Book and verse, respectively," Wilder answered, his eyes fixed on the prisoner. "They are the primary literary units into which the Qur'ân is divided."

Simmons nodded at Wilder. "Don't let me interrupt your inquiries, Colonel. They are proving to be unexpectedly—illuminating."

Wilder grinned with the left half of his mouth. "I'll take that as a compliment."

Simmons shrugged, offered a brief half smile in return. "I'm particularly interested in why Mr. Ali doesn't want to be paraded before Saudi or Iraqi officials. Or what he hopes to gain by undermining their attempts to destroy the fusion project yesterday."

Wilder shrugged. "As I said, Mr. Ali is not just our enemy; he's also the enemy of most Arabs and Muslims."

Chu leaned forward. His voice was sharper and more focused than Wilder had heard before. "Why?"

"Because the Arab nation states have become just that; they are *nation* states. Despite their Islamic rhetoric, they are every bit as secular in their motivations and machinations as we are. And that is fundamentally repugnant to the Muslim faith. It says in the Qur'ân:

Those who conceal
Allah's revelations in the book

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And purchase for them
A miserable profit—"

The prisoner interrupted, concluding with:

"—They swallow into themselves
naught but Fire;
Allah will not address them
On the Day of Resurrection,
Nor purify them:
Grievous will be
Their Chastisement."

He bowed his head, murmured, "*In'ish Allah.*"

Wilder was silent for a moment, then spoke softly. "I'm sorry if my reciting the Qur'ân offends or disturbs you, Mr.—"

"I am Mushaf al-Iftal: I cannot be offended by the words of the Prophet, but you accrue greater damnation upon yourself by using them as tools in an interrogation."

Wilder resumed his seat, pulled it closer to the prisoner. "I don't wish to use them as tools, Mr. al-Iftal—as least, not primarily. I see them as a way of trying to understand your actions as *you* perceive them."

"And why should I help you understand what I fight for and why?"

"For two reasons. First: if you don't tell *us*, I will bring the Saudis and Iraqis here, and you will—eventually—tell *them*, and in so doing, you'll alert them to the existence of your organization: a deeply covert fifth column dedicated to the overthrow of their secular authority.

"Second: I've already guessed most of your reasons, so you're not giving me much information that I don't already have—or wouldn't learn simply by turning you over to your own countrymen."

Al-Iftal stared at Wilder, then looked away. "My testimony, and my involvement in yesterday's events, must go no further than you and your government. No one else."

Wilder looked at Simmons, who nodded. Wilder turned back to the shooter. "Agreed, Mr. al-Iftal."

The captive raised his head until he seemed to be staring at the ceiling; which he addressed with:

"There has come to you from Allah
Light and a Perspicuous Book."

He lowered his head, stared at Wilder. "The Qur'ân is more than a book of laws and teachings; it is the living vision of our future—and yours. There is but one outcome for those who reject Allah—the outcome that is foretold in the words of the Prophet, that is shown in his vision. It is written:

Those who reject Faith,
neither their possessions nor their progeny
will avail them aught against Allah:
They are themselves but fuel for the Fire.

Al-Iftal lowered his eyes until they met Wilder's—and he smiled. "You see," he said, "it is the fusion—it is your own fire—with which you shall be burnt. You are the whetstone upon which Allah sharpens our edge, the challenge whereby he strengthens our resolve. It is kismet that you should be the agents of your own destruction."

Wilder raised an eyebrow. "You'll excuse me if I don't share your interpretation of the holy writ. I find it—improbably contemporary."

Al-Iftal shrugged. "Say what you will; the words of the Prophet contain the images of kismet. For Allah promises this fate in many ways and many words:

As to those who are rebellious and wicked,
their abode will be the Fire:
every time they wish to get away therefrom,
they will be forced thereinto, and it will be said to them:
"Taste ye the Penalty of the Fire,
the which ye were wont to reject as false."

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—And we who keep true faith with those words, who persist in our literal belief of those ancient visions, we shall prevail: we are the New Ummah."

"'Ummah'?" asked Simmons.

"A Muslim brotherhood; the foundation of Islamic communal life." Chu's clarification silenced everyone in the room.

Wilder turned to Cory. "Your family—Moro?"

He nodded. "Half. My mother was from Mindanao."

Simmons leaned back. "And you are a Musl—"

"What I am is my own business." Chu's interruption was accompanied by a narrow-eyed stare at Simmons.

Al-Iftal shook his head, almost smiled. "Typical."

Chu heard the derisive tone, leaned forward. "Just what do you mea—"

Wilder put a hand on Cory's arm, felt the wiry bicep growing taut, but kept his eyes on al-Iftal. "What is it that you're calling 'typical'?"

"Your friend's denial of his so-called 'faith.'"

"He has a right to privacy, particularly in religious matters."

Al-Iftal looked away, sniffed as though encountering a foul odor. "A true servant of Allah seeks to profess his faith, not hide it. But this is what one expects from the many mongrels who profess themselves Muslims."

Wilder tightened his grip as Chu's over-tensed bicep began to quake, kept his own voice level. "'Mongrels'?"

"Mongrels," confirmed al-Iftal. "Those peoples to whom we brought Islam and who abandoned us when we—when Allah—called upon them, called them forth for jihad. They sold themselves—by silence or collaboration—to the West, as did the countless oil sheikhs and prime ministers who defiled the name of Allah every time they bowed toward Mecca minutes after bowing to the dollars and technology of infidels. Allah warned of their betrayal:

Turnest thou not thy attention to those
who turn in friendship to such as have
the Wrath of Allah upon them.
They are neither of you nor of them,
and they swear to falsehood
knowingly.

Thus:

Of no profit whatever to them,
against Allah, will be their
riches nor their sons:
they will be Companions of the Fire,
to dwell therein."

Al-Iftal shrugged. "As the masters burn"—he turned to look directly at Chu—"so shall their dogs."

Wilder let Cory move forward from his restraining hand. The young agent's tone now matched al-Iftal's in calm and surety. "You only cite the passages that suit your purposes. You've apparently forgotten that, regarding nonbelievers, Allah tells his people—

Therefore be patient with what they say,
and celebrate constantly the praises
of thy Lord,
before the rising of the sun, and be
fore its setting;
yea, celebrate them for part of the
hours of the night, and at the
sides of the day:
that thou mayest have spiritual joy."

Chu frowned. "Judgement and vengeance are the prerogatives of Allah, not humans. Muslims are enjoined to be patient, to be models for those who have yet to hear Allah's Word, to be kind, charitable, forgiving, humble. But you—you've turned a holy book into a primer for murderous fanatics."

Al-Iftal smiled patiently, turned back toward Wilder. "You see, unlike the mongrels, the New Ummah embraces the entirety of the Qur'àn—including those parts which tell us to be lions in-

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stead of lambs. For centuries now, we have been weak in our faith—otherwise, the luxuries and technologies of the West could never have made us competitive, covetous, jealous of each other. But some of us remember. We keep our eyes upon the Qur'àn, our ears attentive to the words of the Prophet."

Wilder, who sat with hands folded and eyes on the prisoner's face, nodded. "I understand your motive. Now let's talk about yesterday's events. You sabotaged a Pan-Arab attack upon an American fusion reactor. How does that fit in with your rejection of Western secularism and technology?"

Al-Iftal swept his hand in a slow, smooth circle upon the tabletop, as if sweeping meditatively through a thin mixture of wheat and chaff. "I have already told you: the heat of your fusion fire will temper the steel of our resolve. It will bring about the great jihad, envisioned by the Prophet."

Simmons leaned back. "Your jihad—your holy war—will be a byproduct of our fusion technology?"

Wilder shook his head. "Jihad doesn't really translate as 'holy war', Simmons; its meaning is closer to 'ultimate commitment.'"

Al-Iftal looked up, a pleased smile accompanying his words. "I must compliment you on your understanding of Qur'ànic nuance. It is uncommon in a Westerner. You understand, then?"

"I think so. You *want* us to develop fusion—because it will topple the secular regimes of almost all the major Arab nation states."

"Just so. Consider: what has prevented us from achieving our rightful national and religious stature over the past 100 years? Your armies? Your economic leverage? Hardly; the West's ability to maintain military and commercial influence upon us has always been limited. No, we have been defeated by our own factionalism and because we forsook our brotherhood in Allah.

"So we of the New Ummah welcome your new power technologies—but particularly, your fusion reactor. It will bring about the doom of the secular Arab governments. The West will have all the energy it needs, and so your interest in our oil will diminish. Your dollars and yen and euros will vanish, and throughout Arab lands, there will be famine, uprisings, and plague while your nations grow fatter—and lazier."

Simmons gaped. "And that's what you *want*?"

Wilder nodded. "Of course it's what they want; they want the general populace to reject and hate secular governments and philosophies. They want to breed a people who are accustomed to death, strife, hardship—and who are utterly devoted to Allah and jihad." He turned to al-Iftal. "But I don't understand how you expect to topple the West, particularly if we become more powerful as a result of the new energy technologies."

Al-Iftal shrugged. "Yes, you become more powerful—but also more vulnerable. Your new energy will come from a very finite number of centrally-located power plants and rectenna fields. The power will be distributed through a complex system of transforming stations, and the destruction, or even disabling, of any one of these facilities will have calamitous results. Think of it: whole cities without heat for homes, without power for businesses, without electricity for the transshipment of needed goods—such as food."

Simmons looked dubious. "I think you overestimate the ease with which our key facilities can be sabotaged, and you can't tell me that every single one of your terrorist squads is going to accept the fact that it's on a suicide mission."

Al-Iftal smiled again. "Can't I? Read the Qur'àn; a believer knows that he will be with Allah if he dies fighting the infidel. This is central to our vision of the future: a future in which we will never fight in the open; in which there will be no Westernized Arab leaders

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who can be tempted, bribed, and corrupted; in which there is no secular agenda to distract us from our vision. Our economies will be ruined, and our people desperate—but they will be eager to attack those who have destroyed them."

"Mr. al-Iftal, destroyed nations—or peoples—are generally incapable of destroying anyone else. There's a saying in the West: 'The race is not always to the swift, nor the fight always to the strong—but that's the way to bet.'"

Al-Iftal smiled. "A very American saying; brash, self-assured, energetic. But consider an older, less witty piece of wisdom: Aesop's parable of the tortoise and the hare. Your technology is fast and strong, like the hare. It is, admittedly, the very epitome of power. But the faith of the New Ummah is steady and sure, like the tortoise. It is a persistence that has endured all powers, all rivals, all struggles. We had started down the correct path with al-Qaida, with the 9-11 attacks, but we had not gone far enough. We were still too soft, too eager to spare our own populations, too dependent on non-Arabic nations that called themselves "Muslim"—but abandoned the jihad within a few months. Now, the fire will purge us, purify us, make us absolute and irresistible instruments of Allah's will. When you perfect your fusion you will perfect our faith—and undo your world."

Simmons rose. "I've heard enough of this crap. I'm going to make a report."

Al-Iftal was still smiling as Simmons opened the door. "It is an interesting contest, is it not—this race between the power of your technology and the power of our vision? I, for one, anticipate the outcome with great eagerness." He paused, catching Simmons' eye. "I wonder: do you look forward to the outcome as much as I do?"

Simmons returned al-Iftal's stare and then left. Chu, holding the door, looked at Wilder, who shook his head. "Close it behind you, Cory." He did.

Al-Iftal's smile dimmed a bit. "Mr. Simmons does not seem to take the New Ummah very seriously."

"Maybe he's right not to."

"Why? Because the West has so many weapons, so much money, so much power?"

Wilder shook his head. "No, Mr. al-Iftal, because we have a vision of our own."

"Which is?"

"A world in which all people—and all faiths—can enjoy the benefits of peace and prosperity in mutual toleration. And that vision has been the impetus behind much of our technology."

Al-Iftal's smile broadened. "And look at the humanitarian triumphs of that technology: napalm, nerve gas, nuclear weapons."

It was Wilder's turn to smile. "As though your New Ummah isn't ready to use each and every one of those weapons and others—as certain of your forerunners proved, first at the Twin Towers, and then on the Peace Bridge in Buffalo. Mr. al-Iftal, if the last five centuries of technological progress—and all those preceding—have shown us anything, it is that every new invention can be a great opportunity for either good *or* evil: the outcome depends upon the character of the people who wield it."

"Such as generations of Western presidents, prime ministers, premiers and other assorted imperialists? Each has used new technology for the aggrandizement of themselves and their peoples."

"Often, yes. But just as often it was used to cure diseases, to increase food production, to control population, to inspire and to explore. That is our vision, Mr. al-Iftal. Whether or not it started in the West is moot. It's a vision that has spilled over all borders, into every tongue, and even across denominational divides. This is a vision for us all, about us all—and in which all can have an equal share."

Wilder stood. "And that's the real difference between our visions, Mr. al-Iftal:

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ours is for any- and every-one. Yours is for a chosen few. But what you're choosing for those few—disease, famine, disaster—hardly seems like a vision of the will of Allah; it seems more like hell."

Al-Iftal sneered. "What would you know of the will of Allah?"

Wilder shook his head. "Nothing. But I know something about the will of human beings, about parents wanting to see their children safe and successful, rather than starving and desperate. That's a universal vision, Mr. al-Iftal, stronger than any other—including yours."

Al Iftal shook his head. "You do not understand. They will choose Allah above technology."

Wilder opened the door. "Perhaps, but they will choose the welfare of their children before anything else. And I wonder which of our visions really offers them a better hope of that. Don't you, Mr. al-Iftal?" Wilder shrugged and closed the door.

After a moment, Mushaf al-Iftal's smile faded, disappeared. He continued to stare at the door's institutional-gray surface long after Wilder had left. ■

IN TIMES TO COME

Vincent Di Fate's cover for our July/August double issue illustrates "The Fire and the Wind," by G. David Nordley. One of the most familiar kinds of situation in science fiction concerns the harrowing predicaments that people can get into when they visit an alien world. But what *is* an alien world? Well, that depends on where you start. . . .

Richard A. Lovett's science fact article has the perhaps improbable title "From Salt Foam to Artificial Oysters," but it actually makes perfect sense. The subject is what people might do to alleviate global warming and the problems it can bring, and the premise is that conventional thinking on the subject is much too narrow. So here are some really *different* ideas.

Lovett also has a short story in the issue, which puts him in good company: we also have a smorgasbord of stories by such writers as Michael F. Flynn, Bud Webster, Ron Goulart, Grey Rollins, David Brin, and Geoffrey A. Landis—plus one or two who might be new to you. And, as is our custom in the double issue, we'll present the results of The Analytical Laboratory for 2002—your own choices of the best of what *Analog* published last year, with some very clear winners and some hotly contested races.

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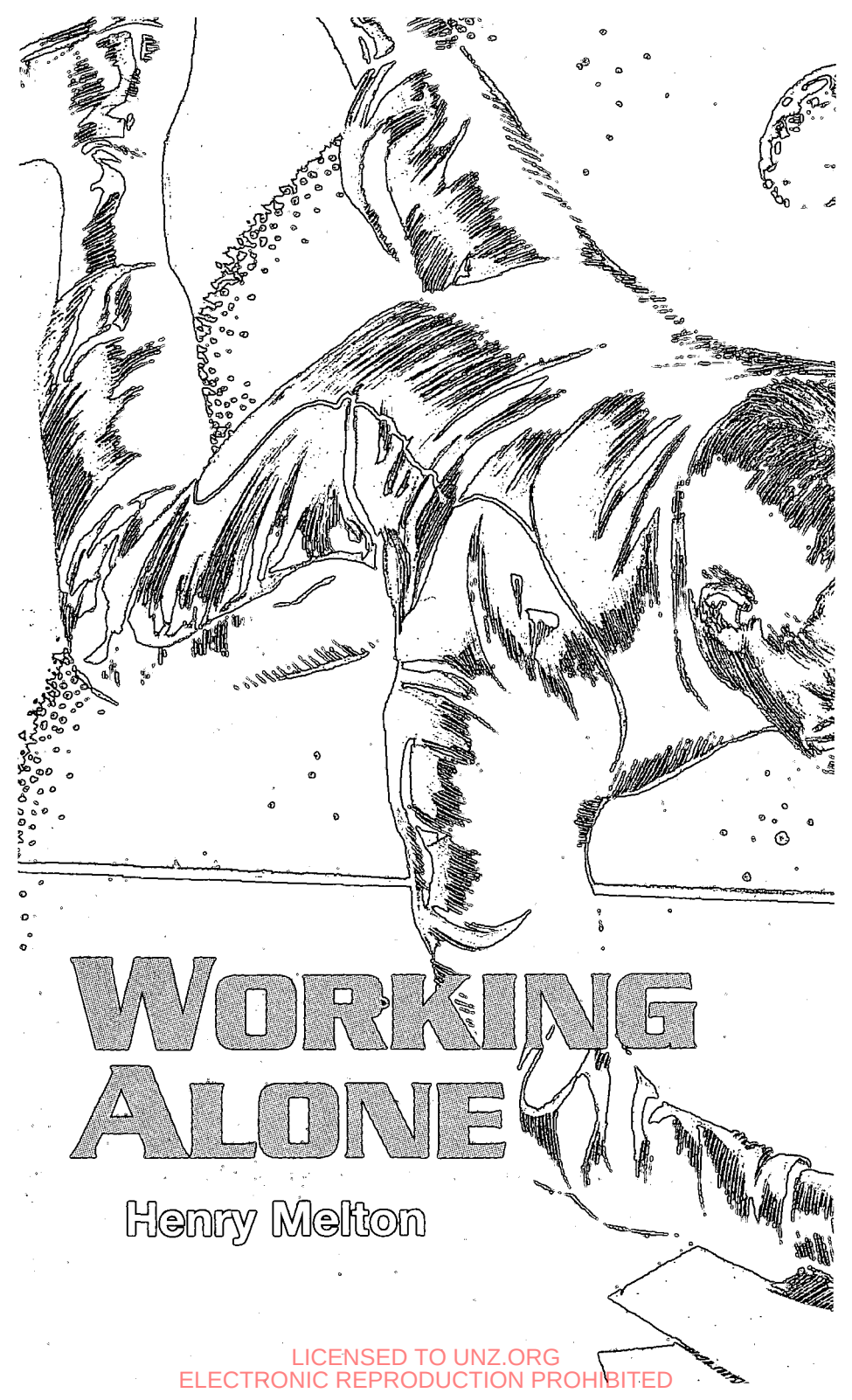

Working Alone

Henry Melton

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Sometimes people can solve each other's problems—in unexpected ways.

Illustration by Vincent Di Fate

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Silence jolted Barry Altman awake. His heart raced two beats as he struggled in the weightless darkness to anchor himself. The grip of the chair alone kept him from knocking his head against the close-in walls.

I shouldn't have dozed off like that. He blinked the sleep from his eyes and turned the cabin lights up a notch. *How long have I been drifting?*

Quickly, he ran through the checklist—an old plastic sheet barely readable in the dim cabin light. The little asteroid shuttle was old and long overdue for an extended stay at Ceres docks, but it had proved reliable, if cranky.

Maintenance is not my job. The *Ace* was a leased steamer—about the only one he could afford. A single seat, plus enough cargo space to haul groceries and mail to the numerous mining settlements in this part of the belt. In the resupply game, travel time was not an issue, just regularity.

Ice and energy were easy enough to come by, out here in the cold part of the solar system. Find a pilot willing to spend weeks making deliveries, and a delivery service could be made marginally profitable.

His mind had already started to stagnate when the employment advertisement appeared like a ray of light over his bunk in the transient hotel. The next heavy transport back to Earth-space wasn't due for another six months—he would be insane by then, if he had to live in dark quarters, lit only by the perpetual "entertainment" screens.

I am a writer. His output had been choppy and fragmented. He could never remain centered long enough to bring his protagonist through a coherent scene. *The place was killing me.*

The delivery job looked like heaven—days at a time with no distractions, no entertainment screen, no chatty roommates. He signed up that day.

And when my novels finally sell, this time will be great source material. That's what he told himself every day since he had left Nebraska.

He slid back the thermal insulating window shield and tried to focus on the stars outside. *I've slept through the whole deceleration.* It was time to find asteroid 12885 and line up an approach.

If the autopilot was up to its usual standards, he should be able to eyeball the rock. A tap on the orientation thrusters set the *Ace* into a very slow roll. He picked up his binoculars with the IR enhancers and started scanning the starfield. Even if the rock was nearly black, as some were, the IR would show it as a glowing patch, quite distinctive from the stars.

Several full rotations and a plane change later, there was still nothing.

Barry sighed. *I guess I'll have to give them a call.* It was hard enough dealing with miners that were openly amused by newcomers. Admitting that you were lost made it that much more difficult.

"Door to Door Delivery Service. Requesting a landing beacon from asteroid 12885. Please acknowledge."

The radio showed no sign of a response. He repeated the call, and then turned the gain all the way up. Nothing.

"Okay. Maybe they are asleep." He fumbled for the delivery order. This wasn't a destination he had picked before. *"Nobody Mining"—that's a little operation for sure.* No one would be monitoring the radio.

I'll have to figure it out myself.

He swiveled around in his chair to face the navigation computer. It was a simple-minded gadget—punch in the origin and destination, and estimated travel time. It would contact Ceres for the latest orbital elements and do the calculations. Barry usually had to do it two or three times to get the fuel and energy to come in under budget, but once he had a solution, piloting was just a matter of pressing the "GO" button.

The computer training module had spent an hour going over some of the other functions of the device. It logged

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your ship's motions and could also get your position from the beacons strategically located throughout the belt.

"I need my position." The downloaded elements of asteroid 12885 wouldn't have changed.

The frayed user's manual was clipped to the top of his work documents. At least every other trip, it bailed him out. He turned to the appropriate page and following the directions, tapped the Function-8 key.

The display flickered and went blank.

He paused with his finger hovering over the next key. *Is it supposed to do that?*

ERRORCODE 13.

He stared at the display dumbly for a long pair of seconds, and then paged frantically through the book to the list of error codes. There it was: *ERRORCODE 13—Power supply fault. Check connections and restart.*

"Connections? This thing is built-in." He hit the reset switch. After the standard greeting display, it prompted for a command.

Hesitantly, he pressed Function-8. Instantly, the failure repeated—ERRORCODE 13.

Okay, think this through. He glanced at the window. The Universe was black out there, sprinkled with lights. *Power supply fault? Power supply?*

The thin user's manual wasn't going to be any help. The pages mocked him. It told him how the navigation computer worked, not how it failed.

He blinked his eyes, trying to make more sense out of the text than was written there. It flickered.

His mouth gaped open as he looked over to the utility console, where the water and air and electricity and other mundane functions of the ship were controlled. The power level light was a sick, pale yellow.

I am losing power!

Burt Durham tapped the radio. He had been expecting a mail delivery for three days. Still nothing but occasional static on the short-range band. *I really miss being able to call home.*

The catalog listed a Net relay for 3000, plus link charges. Expensive for personal use. Out here, hand carried messages were a lot cheaper, if delivery time wasn't an issue. The distress beacon for 500 was a compromise.

But how long will Belinda put up with it? He had taken this one-man post to earn their way out of her mother's cube. It ranked as hazard pay, putting up a water storage tank on this rock all alone, but it was a long job. Welding the 534 curved puzzle pieces together took months.

Working in the dark, with nothing but music so old that it had worn groves in his ears, living by the checklist—he wondered if she had written him off with that last letter. He re-read it every night. The acid was gone from her words—or maybe he had just developed scar tissue.

Barry wiped the moisture off the *Ace*'s one lone window, and aligned the sighting scope on Jupiter. The telescope tube was no wider than his thumb and had half the yellow paint chipped off from banging around in the tool chest. At least the optics still worked. With Jupiter in the right-hand crosshairs, he turned the verniers to bring another dot of light into the left-hand target. He corrected for the slight tumble of the ship and prayed that it was indeed Ceres that he was aiming at. A couple of readings would tell him just how lost he was.

As near as he could guess, the charging system had gone out. As he slept, his cabin batteries had sagged down into no-man's-land. If an alarm had gone off, he had been too dead to notice.

More energy than he could ever use was sitting in the engine power cell, but it wasn't electricity. Without electricity, not even the engines would run. It controlled the feeds. The charging system should have charged the batteries off

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the engine. Obviously it hadn't.

Every switch with an off position was in it. After searching for several minutes by the slowly sweeping beam of sunlight through the window, he located the circuit-breaker panel and hesitantly shut down the less critical systems. Even the air was stagnant now. Fingers were crossed that he would know when to refresh it.

Calculating on paper, he copied down the angles and opened the navigation manual. There were four pages on navigating the hard way. By faith alone, he knew there was enough juice in the batteries for one burn. He would run the calculations manually, check them on the navigation computer once, and then go.

I wanted silence. Now he had it. Heart and lungs and a neglected stomach supplied the only noises now.

"Nobody Mining Daily Checklist." It was clean of marks. Habit bred bad habit. Burt's first week, blackening the list and then rubbing it clear at the end of the day seemed satisfying. Then it seemed pointless, a week later forgotten. There were days when he had loaded the cage, jetted over to the work, and been ten meters into verified seams before he remembered to look at the checklist.

Nothing matters but the seam. He could lose himself in the painful, bright destruction which flowed smoothly into red creation—union. What had been two was now one.

The company needed this water tank for something, and when the day came to pressure-test, then he would see how well his seams held. Rework was a disgrace.

For now, he was a bug on the petal of a great dark flower, intent on the seam and worried about Belinda.

Barry's stomach dropped into free-fall. *Early!* His ears told him the same. The engine had stopped prematurely.

Then with a comforting push into his couch, the engine roared back to life. That lasted a second. Then off again. *It's stuttering.* A triplet of shakes, and then nothing.

Barry waited a dozen labored breaths. *No, that's it. No more juice.*

He hit the reset switch on the navigation computer, but after the first hint of a screen flash, it was dead dark.

The electricity was gone.

He panted. He could barely get out one breath before he needed another. *Carbon dioxide. It's not just terror.*

Oxygen hissed, in response to his hand on the lever. He kept it up until his ears started to hurt. Then he forced the manual purge switch, until the pressure eased.

He breathed easier. *Wasteful of air, but I'm dead anyway.*

"I'm dead now!" The words aloud had a tentative sound to them. Perhaps he still didn't have the air pressure right. "No matter."

The creeping path of the sunbeam across the cabin had changed slightly—perhaps because of the gasses he had vented. The patch of bright illuminated his papers, an untidy collection of old manuscripts.

His most recent work was inaccessible, in the computer. Changing jobs so often, he had fallen back to his practice of keeping paper archives. You can't edit files on an incompatible disk.

Still, he had splurged too much of his weight allotment on those. He should have scanned everything into Net storage and burned them long ago.

"Burned them?" *Where had that idea come from? I never intended to burn them. They might be valuable when I become rich and famous.*

He felt his lips crinkle as he smiled with pity at himself.

I will never be rich and famous. Not even posthumously. They're worthless old papers.

Sometimes new work would be commissioned after an author had died, us-

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ing old notes, or even just the titles left behind.

"Don't be silly." He tasted the feel of the words on his lips. "That sort of treatment is only for the famous. And I never made it."

Still, if the ship was discovered eventually, perhaps he should leave something. A will perhaps?

He pulled out a sheaf of papers. They were printed on one side only. He fished a pen from his toolkit.

To Whom It May Concern, he started. His lettering was shaky.

"Tomorrow," Burt promised himself, "I will take off early." Three weeks running, he had worked long hours. Red cooling welds were more attractive than the books he had brought along for the stay. "I can't afford to finish too early."

Long jobs in space had taught him about himself. He could take solitude, as long as his hands were busy. Too many days off would breed dangerous thoughts. A vacuum worker should never become too comfortable with the nothing outside his suit.

A co-worker, Bill Johnson, had been a bungee addict last year. The cord held, but the ragged crystallized break told the story. The tie-off had gone cold-brittle. Burt had been in the crew that found him. The cord was extended, orbiting his body. He had it in a grip of death.

The *Vacuum Workers Quarterly* had a regular column listing fatalities and how they had happened. He never missed an issue. They were sobering, and he paid attention. Belinda should never be a widow. That's why he rented the distress beacon. He just hoped he never had to use it. Activation and the rescue would take years to pay off.

He plucked the worn letter from its clip as he settled into his sleeping web and read it again.

You never loved me . . . hiding off in the dark . . . pay no attention to my problems . . . Mother says . . . the girls at the office say . . . if you were any kind of a man . . . I don't know why I put up with you. . . .

The words ran together in his head. Last month, seeing it for the first time, he had stuffed it back into the envelope and tried to stuff it into the back of his mind. She had sent angry letters before, but not quite as bad as this one.

I should have stopped everything and sent a reasoned reply with the same delivery man. As it was, he had ripped up his chatty nothing of a letter and kept his silence.

So now she had his silence, on top of whatever other offences he had committed. What would a month of that do to her?

He looked at the calendar, with his smudge marks on it. When was the next delivery due?

A sparkle of light flickered in the window as Barry moved in his seat. A shock of unexpected hope shook him from his lethargy. It died quickly.

Frost. The condensation has turned to frost. The air was getting colder, making it harder for him to doze off. With no engine heat and the climate control system as dead as the lights, the ship was cooling down. In the asteroids, so far from the Sun, that was cold indeed.

"Maybe I'll freeze before I suffocate."

Waiting patiently for a dozen seconds, he finally reached his hand into the moving beam of sunlight. *Not much warmth there.*

He had almost died of exposure before. They were high-school boys, a half-dozen of them camping out together on Signal Hill. The waters of the Dismal River in the distance had prompted him to take a hike. A fall down the edge of the riverbank had left him with a broken ankle, trapped amid a pile of driftwood logs.

It had been two days later when his mother had started checking with the other families. No one had noticed that he was missing.

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A sheet of paper floated into the beam. He snagged it—page two of his will. He slipped it back under its clip.

All of this is useless. It could take a thousand years to find me, or more. By then, none of this will matter to anyone. I will have been forgotten.

Being forgotten—that bothered him. It always had.

Barry had never subscribed to the notion that a person's only immortality was in the memory of his friends. Either God was real and He provided an afterlife where the dead continued a conscious existence, or there was no immortality. No half measures allowed, to his way of thinking. All the religious training of his younger days had come racing back to the forefront of his mind since the blackout. His neglected prayers had been reactivated with a passion.

But still, he could be chatting with the angels, and after a memorial service back in Nebraska, that would be it. Barry Samuel Altman's earthly existence was gone. He spawned no family. He touched no one's life. He wouldn't even take up space in the old family plot in Thedford.

It's my own fault. Always following my dreams, at the expense of my life. This trip is the perfect example. Be a hermit so I can write—and it has cost my life.

The paper drifted off again. He glared at the clip. Not even that worked right on this ship.

He released the hugger and drifted free of his chair to snag it.

Weakly, Cook took the cool metal into his hand. "Thank you." He glanced at the settings. It would have smashed his chest into a thin layer of red on the ground below him. He set it to safety, and eased it down.

The fragment of one of his unpublished novels dropped him off into vivid memory—the fictional world of Cook, a loner wandering a world of forests, searching for his own identity.

"I'm sorry, Cook." Tears started forming, quickly wiping out his view of his space-borne coffin. He blinked and shook his head to clear them. His character was a friend closer than anyone in the real world.

"I had plans for you, Cook. I had a whole life planned out for you, if the trilogy sold. It's so unfair to leave you there, at the end of the first book, with power, but no idea of what you should do with your life.

"I had plans, Cook. You would have had a life! Your soul-mate would have appeared in the third book. You would achieve your destiny. You would have your own kind of immortality.

"If only that first book had sold! I was frightened, you see. Without a sale, writing the sequel would be a waste of time—or so I thought.

"But it left your life truncated, your destiny out of reach."

He looked over at his files. Who else was there?

Able stared back at him. The technological genius would have been forced into mythic state as the sire of a whole sub-species of humanity. But now, at the end of his unsold novel, he was a slave riding in the belly of an alien ship.

And there was Horace, poor robot. "I never got around to plotting that final confrontation, did I? You spend thousands of years looking for your creator, and how will you cope when you realize that he is long dead?"

Other faces started appearing in the darkness. There was Sue, and Queen Hanna, and Elizabeth. More than any real person, they were slices of the true love he had never met.

"I love you all, my people. I am so very, very sorry I have failed you. You have no immortality, beyond the echoes in people's minds, and I have failed to put you there."

There was no heaven for an unpublished character.

"Nor hell for you, Kal, either. I had more story for you too, my friend. I

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would not have left you the monster you were in the first book. Redemption was possible, if I had ever written you to the Pit."

Barry plucked pages from his old manuscripts, reading fragments from his old work in the uneven sunlight, apologizing to his unpublished characters, crying the tears they could not make for themselves. Before he slept, the air was full of white corpses, silently standing judgment over him.

Burt woke to the clock and dressed in a set of overalls freshly dried from the night's low-impact laundry box. He checked off the daily report he had forgotten from the night before. A routine life, until breakfast.

The radiated milk was empty. He had powder, but the empty container of the fresh stuff made him check his calendar. Yes indeed—the delivery was at least five days late now.

It had been late before, sometimes a day or two, but never this long. *What has happened?* There was a radio receiver that could pick up the *System News* broadcast from Earth, but he hadn't used it in ages. Besides, it had an alert channel, and nothing had triggered an alarm. Listening to the tribulations of society was annoying and useless. Still, maybe he should check for some Ceres disaster that would have caused the delay.

Tomorrow. I'll be late to work. He checked the digits on the clock. On solo jobs, getting to work on time was a ritual. Let that slip and everything would go downhill.

He scanned the checklist, thought about making the marks for less than a second, and then loaded the cage for the day.

Belinda was on his mind again. *If the mail is late, what can I do?*

Short-range radio was very low-power for a reason. On some jobs, the distracting chatter from neighbors made radio useless. But anyone within range just might have a Net relay and could forward a message to Belinda.

He double-checked the radio in the cage. It was already cranked up to maximum sensitivity.

He transmitted, "CQ, CQ. Anyone in range?" He repeated the call on all available common channels all the way to the work site, but there was no response.

What if the transport had run into trouble? What if he was stranded here with no supplies? What if he *had* to use the distress beacon?

It would wipe him out, financially, but then he could talk to Belinda.

He darkened his visor and struck the first spark. The play of intense light over the work drew his attention and a well-practiced part of his mind took over. The seam started to grow.

The shakes tormented Barry. He had let the window frost over hours ago, and gave himself up to the cold. His body didn't agree. Neither did his brain.

I wish I were technical, like Able. He could take the food paste and junk from the tool box and build a battery strong enough to run the ship, or find a way to override the customer locks and raid the delivery supplies.

He smiled, his teeth chattering. It had taken hours to collect all the papers and re-order the pages. In neat bundles, he had collected the lives of his characters, and written complete biographies of each of them. If the ship was ever discovered, perhaps someone would be interested enough to read them.

Perhaps I should write a biography for me too.

No, my life is too boring.

The shakes hit again, hard enough to hurt.

I've got to stretch. He freed himself from the chair and went through the zero-g contortions recommended to keep muscle tone. There wasn't room to do them all, but anything was better than sitting and shivering to death.

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He wiped the crust of frost off the window. The stars swept slowly across the view, until the Sun's cold brightness made him blink away a tear.

What was that? He looked again at the anonymous points of light. *My mind is playing tricks. Stars don't twinkle in space.*

Soon enough, the Sun swept by, and he looked aside instead of staring at it this time.

There! I saw it again.

This time he locked on to the pattern of stars. One of them was flickering.

It went out of view, and he counted the heartbeats until the Sun came back.

Yes! That has to be human. He watched it, remembering other times he had watched the stars in more populated space. *Welding. Someone is welding out there.*

"Hey! Help!" He slammed his fist against the window.

They can't hear me, or see me. Other than the welding flare, I can't see them.

"Help me! Please."

"Tomorrow," Burt promised himself, "I will take off early." He stared at the seductive, cooling red line. *How late is it?* He glanced at his clock.

"No wonder I'm so tired." He leaned back from his rig and closed his eyes. In spite of the welder's filter, the afterimage seemed to linger there forever.

The filter flipped back, and he shut down the power and the gas feed. Trash and scraps stuffed easily into the catcher bag.

All secure. He unlocked the cage and fired a short burst from the thruster. *Save fuel. If the delivery is lost, I'll need every liter.*

Traveling slow, mind on idle, he allowed himself to admire the half-completed tank. The curve was perfect, unflawed. The heat traces of his welds were clean and even. Only another welder could appreciate the lines, but it was enough that the seams were right. His work would last.

A reflection caught his eye. *Is that a flaw?* It appeared as if the light of a star wavered. On a smooth metal surface, that wouldn't happen. The image would still be a point, crawling slowly across the skin as he moved.

There! It happened again, but the position was different.

He turned his head. Unwinking stars, and the bunkhouse, half in the sunlight, were all he could see. But something. . . .

A light flared brighter and then faded over several seconds. *What is that?* It was nothing like an engine.

It flared white and then yellow to red—its position against the star had shifted. It had to be close.

"Hello ship!" He hailed on the radio. There was no reply.

Like clockwork, the light bloomed and faded.

"Can you hear me? Delivery ship, is that you?"

There was nothing on the radio—no change in the light.

But somehow he had the feeling it wasn't a machine. The timing was regular, but not precise.

He calculated the cage's fuel in his head. The unknown ship had to be close, but he had no way of ranging it.

If that is the delivery, then Belinda's letter is on it. It felt like the ship was approaching. *Better approach now, rather than as it recedes.*

He judged the vector by eye, and fired his thruster.

That's enough. He coasted.

After long minutes, he could make out the shape of the transport. Still closer, he could see details.

The light, flashing from inside the cabin, stopped, to be replaced by the sight of a naked man shouting silently at him through the window.

Matching speed wasn't difficult, but as he latched the cage to the transport, Burt worried about stopping them. The little open frame shuttle hadn't been designed for tug work.

The delivery man worried him. Hand

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signs said he was okay, but Burt could see him coughing badly, as if the air inside were bad.

Barry tumbled through the hatchway as soon as the airlock allowed.

"Close it." He coughed, gasping in a lungful of the clean air. "Smoke."

The big man dogged it shut. "Fire?"

Barry coughed again and shook his head. "No. Under control."

He was offered a blanket. Barry nodded his thanks and wrapped it around him.

"Burt Durham." He offered his hand.

"Barry Altman, Door to Door Delivery Service."

Durham let out a sigh. "Nobody Mining. Is the shipment okay?"

"Yes. Should be." He quickly explained the power outage. Relief settled on the welder.

"Important shipment? They don't tell me what's in the hold."

"Mail from home, but that can wait. What do you need? Did you burn your clothes?"

"Yes, to start. With a total power outage, it was the only way to make a signal light. A wrench from the toolbox sparked when I hit the bulkhead. The air was mostly oxygen by then. It caught quickly."

"Dangerous."

Barry nodded. "But I had nothing to lose. I had given up all hope days before. When I saw the welding light—I had to try something."

Burt nodded. "I worked late today."

"I would have drifted past and frozen to death if you hadn't."

"You were making regular flares. That is what caught my eye."

Barry's face twisted into a wry smile. "Well, the clothes burned quickly. The only thing I had left were some papers—old manuscripts. I fed them to the sparks, one chapter at a time."

"Your stuff?"

"Yes. Old novels that never sold."

Burt frowned. "I bet that hurt."

He nodded. "Those characters saved my life."

Burt did most of the work installing new batteries, but he let Barry help. He could tell that the delivery guy could push the buttons, but he didn't know the hardware. He really was a writer pushing a transport as part-time work. The energy tap was fried. It didn't look like it had been maintained in years.

The extra batteries brought the ship to life, and it started shrieking like a turbine pushed past its limits as the machine woke up to its sad state and tried to fix everything all at once.

But the cargo locks worked. Burt keyed in his access code and the hatch unsealed. He glanced over a month's worth of supplies with no interest.

Taped to the side of a food crate was his mail pouch. He ripped it free and retrieved the letter.

Burt, something has to be done now. Everyone agrees that I should have already filed for the divorce, but I've decided to give you one last chance. . . .

Barry Altman felt like a kid, dressed in Burt's oversized overalls. He listened to the big man's advice. In the last five days, Burt had become like an older brother.

Burt beamed. "You will be saving my life this time. The double bank of batteries will get you safely back to Ceres, but don't waste any time getting the ship into the docks. It's a deathtrap until you get it repaired."

Barry tapped the sheaf of papers. "I will hand-deliver the letter to Belinda, and sing your praises. If she agrees to buying the Net relay, I'll help her with the purchase and bring it out on the next run."

Burt sighed. "It's either that, or default on the job and go back to her in person. A month between letters is too long for us. I'll lose her otherwise."

They shook hands one last time.

They sealed the hatch and the trans-

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port pushed away with the faintest of thrusts until it was clear of the Nobody Mining work area.

Barry went through his checklist and confirmed the readings on the navigation computer, its display crisp and sharp, although the surface needed more cleaning.

He saw Burt's love letter start to slip in the clip and rescued it.

Some of the best prose I have ever written. It was Burt's heart, in Burt's own words, but he had needed a writer to coax them out. It had taken a couple of days before the man had opened up, and even longer before he had shared his wife's letters.

He pressed the button, and the ship's engines started rumbling with the feel of full thrust. Loose clutter started falling to the aft wall.

It is good. Much better than the scene I wrote where Able and Sue realized their love for each other. I'll do that over. Real people talk differently.

Burt and Belinda—how much would these two bleed their lives into his established characters? He flexed his fingers. Barry was aching to find out.■

You cannot hope to build a better world without improving the individuals. To that end each of us must work for his own improvement, and at the same time share a general responsibility for all humanity.

—Marie Curie

Principles have no real force except when one is well fed.

—Mark Twain

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3rd Corinthians

Michael F. Flynn

There are several kinds of truth,
and several kinds of proof.

There was once a Greek historian named Thucydides, who wrote something like this: "When a man finds a conclusion agreeable, he accepts it without argument, but when he finds it disagreeable, he will bring against it all the forces of logic and reason." Now I do not know in which book he was after writing this or even whether he wrote it at all (although if he did not, he should have), but his statement proves something beyond all disputation, and that is that the poor omadhaun has never hoisted a pint at the Irish Pub, for there you will find not a few who will bring all of what little logic and reason they possess to argue on *both* sides of a question.

Yet, while it cannot be denied that a certain dignity adorns the desperate defense of one's true beliefs, it is often a sorrow to see to what extremes a true believer will go.

It was something of a surprise to me when Father James McGinnity, S.J., entered the pub and with a hearty wave to O Daugherty Himself, who stood watch behind the oval bar, placed his bulk upon a stool at its head and in quick succession consumed two glasses of white wine.

Now it was not the wine that was unusual, nor the clerical calling of the man who drank it, for as McGinnity himself was wont to say, the Lord did not change water into wine for no good purpose. What was unusual was the rapidity of the drinking. That and the third glass, the like of which I had never heard him order.

"Don't worry, Tim," the priest told Himself. "I've not become a drunkard. Only I've had a terrible shock today and my nerves need a bit of steadying." He shook his head and muttered, "I hadn't thought such wickedness possible." He had not said it to be overheard, though Himself and I both heard him. Thinking it a matter of the confessional, we

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pressed him no further.

It was a quiet evening, and only a few of the neighborhood regulars were in—there being beside myself only Maura Lafferty and the good father at the bar, while over in the corner, Mousie Moore, that I might have wed saving only that she chose another, addressed a chicken sandwich and a Harp lager. Now Mousie got her name because she was small, not because she was timid, but she had turned very quiet and solitary since her fiancé had drowned. She had not so much as glanced up at Father McGinnity's entrance; nor did she do so at Doc Mooney's, which was louder and more dramatic.

"Joy to all here!" Doc cried from the doorway. "A gin and tonic, O Daugherty, if you please. I feel the need to sip turpentine." He perched himself on his stool across the oval bar from me. "Mickey," he said, saluting me when he had his glass in hand. "*Slainte 'is beatha*! Where's Steve?"

"Oh, the pool table is after being broken and he's gone in search of another."

"And yourself not gone with him?"

"Oh, I knock the balls about a bit, and from time to time one will leap into its pocket out of pity, but I see no need to go traipsing after the pleasure. You seem in good humor tonight."

"Another fine day," he announced, "of slicing and dicing the dear departed. Sam Hourani brought me the most marvelous corpse he found floating over by the chain dam. One of the patrol cars found it, actually, and called the detectives in, but Sam couldn't gaff it without the help of the river patrol."

I looked to see how this talk of a drowned man struck Mousie, but found that she was gone. That was a sad thing, and the sorrow was not that no one had noticed her departure, but that no one had likely known she was ever there at all.

Doc lifted his tumbler to the priest. "Jim! How's the God business?"

The priest grimaced briefly. "Oh, same-o, same-o. Teaching Scriptures to young people too sophisticated to take them seriously."

"I shouldn't wonder," said Doc, who is a hard-shell atheist. "Too many contradictions and absurdities in it to take the Bible literally." He grinned mischievously, for he had often danced this same waltz with Danny Mulloney. Doc had his arguments all housebroken, and liked to trot them out for exercise now and then.

"So there are," said Father McGinnity, raising that third glass of wine and smiling back over it. "Why, Herod was dead for more than a decade before Quirinius was ever governor of Syria."

I could tell by the way Doc's face went blank that the answer took him by surprise, and it was a moment before he placed the reference; but before he could summon a response, the good Father continued. "But I said 'seriously,' not 'literally.' Mutually exclusive, y'see. If you take Scriptures literally, you cannot take them seriously; and to take them seriously, you mustn't take them literally."

"D'ye admit then," said Doc, giving him the squint-eye, "that the Bible isn't true?"

"Oh, the Bible is true; only it may not always be factual."

"How can that be?" asked Maura Lafferty, who had been listening with a puzzled frown and stared now at the priest as if he had suddenly become a Unitarian.

McGinnity swiveled his stool a little to face her. "Now, Maura, have you never read a novel and felt that it had spoken some truth about life? Yet was not the entire story fabricated by its author? There is often more truth in a pure fable like *Beauty and the Beast* than in all the journals of sociology."

"And what truth would that be?" asked Himself as he pulled a fresh Guinness off the tap.

"Why, only that sometimes a person must be loved before he becomes lov-

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able. It's really a very Christian fable, when you think about it."

"That's why we all love Doc," I suggested, but Doc only screwed up his face and waved an arm in disgust.

"If your Bible isn't factual, cover to cover," he said, "you're just picking and choosing which parts you want to believe."

The priest grinned at him. "That's the problem with you atheists. You take the Bible too literally."

Himself laughed so hard he nearly dropped the mug on the floor, and the same being full of my next Guinness at the time. Even Doc's puckered face split for a moment in a grin, for in a battle of wits he relished an armed opponent.

"Jim," he said, "you never cease to amaze me."

"But you see, Doc," McGinnity continued, "the Church really did 'pick and choose.' We received our faith from the apostles, not from the texts. Peter passed his witness on to Linus; Paul, to Mark, Luke, Clement, Onesimus and others; John, to Polycarp of Smyrna. From Polycarp, the Word was passed to Irenaeus; and from Linus and Clement to Sixtus, Cornelius, and so on. At some point, people began to write these things down, often attributing them to their 'founding' apostle. Paul himself wrote several letters, which were later collected, along with others written by his 'team,' and published by Onesimus, Bishop of Ephesus, whom Paul himself had converted while a runaway slave. Eventually, there were all sorts of texts in circulation—letters, gospels, apocalypses, acts, and such like. Some were genuinely catholic—by which I mean 'universal'—while others were narrow and sectarian, or ground private axes. The *Gospel of Matthew* was widely read, for example, even by the Ebionites, and the author of *2 Peter* writes of Paul's letters as already in circulation. On the other hand, the Church Fathers rejected the so-called *Gospel of Thomas* because it was theologically unsound—all full of Gnostic winking and nudging, of Secret Knowledge and Inner Circles. A narrow text for a narrow clique, quite at odds with the catholicity of the Spirit. 'Proclaim it from the rooftops,' He told His disciples. 'Nothing is hidden.' Then there were still other texts, like *1 Clement*, which while theologically sound, were basically redundant. The Fathers had to sort through all of that and decide, in the light of the Spirit, which documents were important, and which were superfluous, or inconsequential, or spurious. *2 Peter* was not accepted until the early fifth century. So, you see, Doc, it isn't that our Faith comes from the Bible; it's that the Bible comes from our Faith."

"What was that *1 Clement* you mentioned?" I asked. "I've never heard of it."

"Clement was a companion of Paul who later became Pope," Father told me. "He wrote a letter to that rather rowdy church at Corinth—the same that gave Paul so much heartburn. It was so widely read and circulated that some early Bibles included it in the New Testament; but the Church Fathers later dropped it from the list. There was also a *2 Clement*, but no one ever supposed it to be genuine."

"But that's just the point," Doc insisted. "Your list is bogus. Matthew never wrote Matthew's gospel, either; and Paul was not the author of *Hebrews*. And Peter's letters are written in far better Greek than one might expect of a Galilean fisherman."

McGinnity shrugged. "My cab driver yesterday had a Ph.D., so one cannot always tell what talents a Galilean fisherman might hide under his bushel. Besides, it was probably Sylvanus who actually did the writing of *1 Peter*—and he could easily have polished his fisherman friend's dictation. As for *2 Peter*, the early Church—Origen and Jerome, in particular—also doubted its Petrine authorship. It was the content and its broad acceptance by the faithful that led to its inclusion in the canon, not

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whether Peter wrote it personally or one of his circle did.

"Spin," said Doc. "You're making excuses for forgery."

"Forgery . . ." Pain showed briefly on the priest's face. "Doc, if it turned out that *2 Peter* had really been written by Linus, who was Peter's successor, what difference would it make? It still reflects the teachings of the early apostles. For that matter, Paul's letters to *Timothy* have an oddly distant tone for letters supposedly addressed to a close friend. Perhaps Paul never wrote those, either—but *someone* did, and that someone spoke for the Spirit of the Church. Our modern notion of authorship was not theirs." He grinned suddenly. "Call it a 'shared universe' in which the Big Name author got the byline." Then his brow furrowed and he turned serious once more. "Forgery is another matter entirely. Genuine forgeries (if I may be permitted the Irishism) are written with the intent to deceive. Paul himself warned in *2 Thessalonians* that fake letters were being circulated in his name in an effort to discredit him. The key to identifying the forgeries is that their *content* is wrong."

"You have an answer for everything," Doc complained. He was more accustomed to discussing such matters with Danny (who simply disagreed), or with his like-minded friends (who simply agreed). McGinnity's arguments had taken Doc from an undefended quarter and consequently he became defensive. "Some people," Doc announced to the bar in general, "will go to any length to defend their position."

"If the position is worth defending, what is the proper length?" Father McGinnity sighed and stared at his empty wine glass. For a moment, I thought he meant to order a fourth, and Himself, no churchly man, scowled just a little, for like many lapsed Catholics he had firm notions of proper clerical behavior. Finally, McGinnity put the glass down on the bar top. "It's when the worth is little," he said quietly, "that the length may be out of all proportion."

"Is it anything that you can tell us?" Himself asked quietly.

"Ah, Tim, it's a terrible thing—enough to test a man's faith in people. But it will be in all the newspapers in the morning, so I suppose there is no harm in my telling you tonight. You see, there's been a new letter found."

A moment of puzzled silence greeted this remark. Oddly, it was Doc who first realized what he meant.

"A letter of Paul, do you mean?"

McGinnity nodded. "It purports to be."

Maura clapped her hands together and said, "How wonderful!"

The priest shook his head. "Not so wonderful as all that."

"A-ha," said Doc. "It contradicts some of your dogmas." It was only a guess on his part, but a good one, for McGinnity nodded.

"It was meant to. That is what is so terrible."

"I would think so, from your perspective."

"It's a forgery, of course, but a damned clever forgery." The priest sighed once more and drummed his fingers against the table.

"We've been calling it *'3 Corinthians*," he said. "That's a misnomer, as there was already another forgery given that name. But we do know that Paul wrote more letters to that fractious congregation than the two that have been preserved. In *1 Corinthians*, he refers to a previous epistle; and in *2 Corinthians*, he mentions a now-lost letter, written as he said 'with many tears.' This new one—it was unearthed during a construction project in Corinth itself—claims to be that lost missive. I suppose we ought to have called it *1.5 Corinthians*."

A chuckle greeted this, but it was an uneasy chuckle, for we could not see where this was going.

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"Right in the first line, after the greeting," McGinnity said, "it reads, 'I write this letter with many tears . . .' And that, of course, is what first made me suspicious."

"Too pat, you mean?" asked Maura.

"Yes. Too pat by leagues."

"What is it that the letter says," I asked.

McGinnity clasped his hands before him and looked not at any of us, but at something in the far distance. After a pause, he spoke. "There was a spurious book written in the second century called the *Acts of Paul and Thecla*. The author was a priest and when he was caught out, he claimed to have written the book 'out of love for Paul.' It tells how Thecla, a young Greek girl, is smitten with Paul and decides to become his . . . 'groupie.' She goes through many tribulations. The governor orders her burned at the stake. Her enemies get a gang of young men liquored up and send them out to rape her. The Romans put her in the arena with the beasts. But really, it was just second century soft-core porn, because in each episode her clothes get ripped off. In *Thecla 5:13*, 'Thecla, being brought naked to the stake, extorted tears from the governor as he beheld her great beauty.' And *Thecla 9:1* reads, 'Then Thecla was taken out of the hand of Trifina, stripped naked, . . . and was thrown into the arena.' But a sudden cloudburst douses the flames in the first case and in the arena a she-lion licks her and then defends her from the other beasts."

Doc laughed. "Where can I get a copy?"

Maura shot him a withering glare, reminding him that if the new age was thoroughly secular, there yet remained secular sins—and a clergy less forgiving.

"Well," said McGinnity, "there apparently was a Thecla—at least her existence was accepted by the early church—and Paul supposedly admits in this smarmy letter that the young girl had been his lover and he begs forgiveness from the Corinthians. That was the reason for the 'many tears.' He cites the scandal as the reason his companion Demas left him."

Doc whistled. "I can see where that might upset a few apple carts."

"Not mine," McGinnity said firmly, "for Paul never wrote it."

"Ah," I interjected. "You mean the manuscript is too recent."

"Oh, no. Not recent at all. Radiocarbon dating puts it in the first century, and chemically the ink is compatible with inks then in use. The papyrus is browned and brittle, of course—again, compatible with its age—but it's remarkably well-preserved. The only damage is a dark crescent stain in one corner, which the chemical tests proved to be where the author set his coffee cup down." He smiled crookedly, and O Daugherty grunted. "But the manuscript was sealed with wax into a pottery container and the pot placed inside a bronze vessel, and the whole was bricked into a niche in a sub-chamber of the building that the building contractor stumbled upon . . ."

"Sounds like someone wanted to hide that letter real bad," said Doc.

"Preserve it, rather," Father told him. "Had the presbyters of that age wanted the letter forgotten, burning it would have been simpler."

"First century . . ." I said. "Then it is very early, I'm thinking."

McGinnity nodded. "We can date it even more precisely. The author made very sure of that. The vessel contained other materials: Some Athenian coins bearing the inscription of the then-current archon, whose dates we know, and an announcement that the doors of the Temple of Janus had been closed—which occurred in the third year of Nero, about our year 57 AD."

Doc jerked as if he had touched a hot plate; and Himself said with eyebrows raised, "From Paul's lifetime, then?"

McGinnity nodded. "And that's rather odd, for we have no other original man-

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uscripts that early." He hesitated, then shrugged. "It purports to be holographic."

"What?" I said. "Three dimensional?"

"No, Mickey, a manuscript is a 'holograph' if it is written in the hand of the purported author."

Doc raised his eyebrows. "In Paul's own hand? That would lend some credence to it," he suggested.

"It might," McGinnity said, "if it were genuine."

Doc uttered a testy cluck. "And what makes you think it isn't?"

"Doesn't the burden of proof lie in the other direction? As I told you, Paul himself warned against malicious forgeries."

Doc waved an arm in dismissal. "Special pleading. Maybe he changed his mind about coming clean and wrote that comment in *Thessalonians* to discredit his very own confession."

McGinnity smiled in a crooked fashion. "Doc, I thought it was you secularists who always insisted on proof, and here you are giving me an argument based on faith!"

Doc began to choke on his gin and Maura spoke up. "I think I know what you mean, Father," she said. "I read somewhere that they can find out who wrote something by the words and sentence styles they used."

"Stylometry, yes. The science was invented in 1851—specifically to study Paul's letters, as it happens. Historians have applied it to certain of the *Federalist Papers* and other bits of anonymous writings. But stylometric analysis puts *'3 Corinthians'* square in the statistical center of Paul's 'style-space.' The language and phrasing match very closely that of the undeniably Pauline letters. And that is the problem. The letter is *too* typically Paul; it is 'super-Paul,' almost as if someone had tallied up all his writing quirks and deliberately applied them. For example, many of the phrases in *'3 Corinthians'* are identical to those found in his other epistles, but are often applied in a skewed sense, as if an imitator were piecing them together for his own tendentious purposes. It is even written in large simple characters."

"Large, simple characters?" asked Maura. "Why is that significant?"

"Well, you see, most of Paul's letters were copied out by his secretaries, like Tertius; but Paul would sometimes add his own personal P.S. At the end of *Galatians*, for example, he writes, 'See with what large letters I have written to you with my own hand.' He did that so the presbyter could hold the epistle up for the congregation to see, for even the illiterate among them would recognize Paul's handwriting. Whoever forged *'3 Corinthians'* used the same stunt. The entire manuscript is written in large letters."

"Meaning Paul wrote it himself and didn't use Tertius," Doc suggested.

McGinnity nodded. "You would expect that, given the highly personal subject matter. That's what I meant by the letter purporting to be holographic. Had it been genuine, I would have been very excited, but it is theologically—and perhaps even psychologically—unsound. The writing is like Paul's, but the content is not. Instead, what we have is the evidence of someone who so thoroughly dislikes the Church that he has gone to extraordinary lengths to discredit Her. To acquire the right sort of paper and ink; to learn the Greek of that era; to go to Corinth itself . . . Ah, to abuse such a wonderful gift for such a petty purpose . . ."

Doc laughed and slapped his knee. "Jim, give it up. One of your founding fathers turned out to be as big a hypocrite as a television evangelist. Don't take it so hard. You've still got hospitals and orphanages and pacifism on the other side of the ledger."

McGinnity sighed and pulled a couple of dollars from his billfold and placed them on the bar. He glanced at Himself and said, "You tell him." Then he donned his cap and walked forth into

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the brisk November Saturday.

In the wake of his departure, Doc's chuckles finally died as he looked from Maura to me to Himself and saw irritation, puzzlement, and unhappiness, respectively. He set his gin and tonic aside. "What?"

"You shouldn't make fun of a priest," Maura chided him.

"Bosh. I like Jim, but he's so tied into his belief system that he can't see something when it's right before his nose."

I turned to Himself. "What did he mean there, at the end?" I asked the man.

O Daugherty shook his head. "Father was right. Sure, it is a sad thing to see such a fine discovery as time travel used for such a petty, vindictive purpose."

Doc, who had picked up his drink once more, set it down again in an emphatic manner. "Time travel?" he cried. "Where the deuce do you see time travel in all that?"

"I wonder if the poor felly died," Himself mused, "and that's why we're not after hearing of the discovery. Nero hadn't yet turned nasty by 57, as I recollect, but there were always brigands and thieves about, especially in a boom-town like Corinth was at the time." He took a deep breath and then, as if Doc's plaint had only just reached his ear, he turned to the other and said, "Why, how else to ensure that the radiocarbon dating would come out correctly? He had to take the manuscript back there, and hide it where it wouldn't be found until now."

Doc smacked the bar with the flat of his hand. "Now that's even harder to swallow than Jim's holy books. Have you taken leave of your wits, O Daugherty? What evidence do you have of that?"

"Why, the stain where the writer set a coffee cup on the parchment. Coffee only came to Europe from the Arabs in the thirteenth century. In Nero's day, the Ethiopians hadn't even domesticated the poor bean." ■

The secret of being miserable is to have the leisure to bother about whether you are happy or not.

—George Bernard Shaw

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LENR Part II

In Part I of this column, I explained that "cold fusion" may not be fusion at all, and that the preferred term is now Low Energy Nuclear Reactions, or LENR. I also discussed my relevant experience as an experimental physicist; experience which led me to reject outright early claims that "cold fusion is all hooey," based on hastily conducted experiments that failed to replicate the original result.

I promised that here in Part II I'd tell you of a new web-site where information can easily be obtained about careful experiments done by competent scientists which vindicate claims of the reality of LENR. The several-month delay I encountered in bringing you Part II brought along a silver lining, that being the publication of a new book on the *sociology* of the cold fusion phenomenon. Since this book goes as far as a book can toward answering the question, "If there's really something to this cold fusion stuff, why haven't I heard about it?," I'm going to review it, too.

Critics might point out—and rightly so—that apart from early failed experimental replications (all of which may have been half-assed), there were sound theoretical reasons to doubt the claims of Pons and Fleischmann that they had achieved "fusion in a jar." If ordinary deuterium-deuterium fusion had really been occurring in their cells, for instance, then the neutron flux that would have had to have been there to account for their measured excess heat would have killed them. Since they were alive, this argued strongly against fusion in a jar.

However, arguing against an explanation for an effect is not the same as refuting that effect's existence. Excess heat was, in fact, measured.

So what happened? Why was cold fusion, now LENR, work held in such disdain?

To the book. It is called *Undead Science: Science Studies and the Afterlife of Cold Fusion*, by Bart Simon (Rutgers University Press, November 2002, ISBN 0-8135-3154-3). Simon is an assistant professor in the department of sociology and anthropology at Concordia University in Montreal. His book is a fairly even mix of sociology, history, and the philosophy of science as they all relate to cold fusion. I found this book exceptionally useful for coming to a correct understanding of why it is that cold fusion work still continues, even though the scientific community long ago dismissed cold fusion as "pathological science." I wish I'd written it myself, though I doubt I could have done as well as Simon.

The only negative I see in the book for lay readers is that in spots the specialized jargon of the professional sociologist may prove difficult to understand. However, Simon writes very clearly and so this is a minor quibble indeed.

Simon's use of the term "undead science" for cold fusion is a good one, for the metaphor is particularly apt. As he puts it (p. 221): ". . . if we cannot allow cold fusion to be dead, we will not be

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able to see the myriad ways in which it continues to survive, always in the shadow of the life it desires but does not have." That desired life is, of course, acceptance of its legitimacy.

I strongly recommend this book because Bart Simon reaffirms the truths that I have independently come to know about the plight of cold fusion and the cold fusion or LENR researcher. For instance, on page 124 he says: "The cold fusion controversy did not end because Fleischmann and Pons were wrong; it ended because CF researchers found themselves lacking social and material resources to argue that they were right." This is part of the answer as to why LENR work seldom sees the light of day and why it languishes in the back alley of physics—the researchers have been deprived of the usual channels for grant money and publication. In short, you don't know about it because they haven't been able to tell you.

This deprivation is particularly difficult for LENR researchers to overcome because the good ones are used to doing their work in the usual way. On page 126, Simon writes (I had to truncate this a bit): "CF researchers work in university physics, chemistry, and engineering departments, they are well trained, and many have reputations as outstanding scientists for work they have done in other areas . . . (T)hey value the peer-review process . . . They do experiments following methodological norms that are indistinguishable from those of other experimental sciences; they value precision and accuracy in measurement . . . They seek to improve their experiments . . . To the casual observer there is nothing in the daily routine of most CF researchers that would indicate that what they do is in any way unscientific." Also, Simon notes on page 154: "The general assumption of most CF researchers is not that recognition of the phenomena should force a wholesale revision of nuclear physics and quantum mechanics but that cold fusion constitutes a special case of nuclear theory applied to the conditions of highly loaded Pd-D systems."

Since the typical LENR scientist is just like any other scientist in how he acts and in how he thinks, why does the disrepute problem persist? Because LENR workers are written off as pathological scientists from the get-go. Again, going to Simon, on page 103: "(T)he pathology thesis effectively competes with and then replaces other possible nuclear and chemical explanations for the phenomenon of cold fusion. In doing this, it serves to legitimate and ground claims that cold fusion is not real by offering a plausible explanation for both potential cold fusion-like anomalies in science and a continued belief in cold fusion by some scientists."

The only potential way I see around the prevailing LENR lack-of-legitimacy misbelief is to expose people to the truth. As I've discussed before, in conversations with those skeptical of LENR but otherwise willing to be convinced of the reality of the effect, I try to tell them where to go to read up on what's happened since 1989.

The problem has always been, however, that it isn't all that easy to just "go and read up" on LENR research. Many of the papers are hard to find, since even the best ones are not published in the "prestige" journals that every college library is certain to have. And even if the papers are reasonably available, most folks simply are not going to track those papers down, even if it requires merely an hour or two at the local college library. Also, there isn't any single paper that is likely to win over a skeptic. Indeed, one of the strongest arguments in favor of LENR from the point of view of the uninitiated is that there are so *many* papers available, that so *many* researchers around the world have been working on LENR and getting positive results. But what library is going to have more than a few papers, and how long will it take to find them in the stacks?

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Wouldn't it be nice to have a single place—a one-stop-shopping site—which would constitute a sizable source of papers on LENR-related work?

Such a site now exists: http://lenr-canr.org. (CANR stands for "Chemically Assisted Nuclear Reactions," another alternate term for "cold fusion.") The site comes via the work of Edmund Storms and Jed Rothwell. Dr. Storms is one of the few LENR researchers in the US who has been investigating the associated phenomena from the very beginning. He is also one of the few who had the necessary experimental expertise to do productive LENR work from the outset, as well as adequate facilities. Jed Rothwell's background is in the software business, where he has been very successful. His interest in LENR goes back to the beginning, and he manages the web-site.

The site itself is wisely short on bells and whistles (in part because the fancy stuff can cause problems for users with slow modems or old computers, particularly those who reside outside the US), but richly endowed with information, all of it exceptionally well organized. I highly recommend that visitors read the four essays presented in the introduction. These essays provide a concise background to LENR, starting with what happened in 1989 and explaining how cold fusion came to be rejected by the scientific community. One essay is actually a science tutorial that will prove invaluable to visitors who are a bit cloudy on the differences between chemistry and nuclear physics.

But the heart of the site is the library, which doubles as an index of papers and books related to LENR. It is organized four different ways, each one mouse click away from the others.

When one clicks on "Library" on the home page, he's taken to a page that has authors with papers available at the site. For instance, one might click on "Schwinger" (in the "Authors" sidebar on the left of the screen), and in the main window will appear the listing for seven (as of the night I'm writing this) papers by Julian Schwinger, and two of them will show a "Download" link.

But suppose you want to see all the papers indexed at the site? Then you just click on "All Authors" at the top of the screen and up they'll come, with the authors' names in alphabetical order. There are a *lot* of names—I counted 141 in the B's alone (Dr. Storms tells me that about 4300 authors are cited, and 2900 references). Many of the authors have more than one paper listed, so you're beginning to understand just how much material is out there. Granted, it isn't all great material, but then, the index to *The Physical Review* lists a lot of dross, too.

Since I am by training an experimentalist, I particularly like the "Categories" arrangement of the available papers. Once that pops up, I can select from the menu on the left, say, "Experiment, Particle," and up comes the listing for those papers. Here's a good one: Iwamura, Y., et. al. *Detection of Anomalous Elements, X-ray and Excess Heat Induced by Continuous Diffusion of Deuterium Through Multi-layer Cathode (Pd/CaO/Pd).* This is just one of many experiments where transmutation occurs in an electrode simply by diffusing deuterium through it.

Finally, if you're only interested in looking at papers that have appeared in journals you trust, you can click on the "Publications" option and easily find your way to that particular subset of the available literature.

Dr. Storms says that with this database, "a person will be able to find any paper about LENR and order a copy from the appropriate source." New papers are made available for downloading nearly every day, and the founders hope that original work will soon be published there also. One more thing: the site is also reproduced on CD-ROM, so if you want one of those, send a message to editors@lenr-canr.org.

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I imagine that for most of my readers, just seeing how many papers have been published about LENR since 1989 will prove eye-opening.

Alas, this will be my last shot (apart from referencing this column) at convincing people of LENR in these pages. The LENR scientist does have truth on his side, but little else—to be accepted into the mainstream these days requires more than that.

What bothers me most about the disrepute in which LENR work is held is not that I think the work will lead to a huge scientific breakthrough, though it might. It's that LENR research is on the same level, in terms of budget, equipment, and expertise, as the thermoelectric power work I did in those summers of my youth. Someday, work on LENR will be routinely done in small college labs across the country. It's a damn shame that today's crop of young scientists is missing out.■

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with your favorite authors!

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Bruce Sterling, Neal Barrett, Jr., and Lawrence Person talk about the Lone-Star science fiction perspective.

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The Hugo- and Nebula-award-winning author of the blood-chilling "Bellman" and the new novel, *Red Thunder,* joins us for a chat about his work.

Go to **www.scifi.com/chat** or link to the chats via our home page (**www.analogsf.com**). Chats are held in conjunction with *Asimov's* and the Sci-fi Channel and are moderated by *Asimov's* editor, Gardner Dozois.

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Probability Zero

The Word Mill

Don D'Ammassa

Arthur Friar's first novel, *Thunder Ridge*, sold more copies than any other book published in 2004. In 2014, he had written every work of fiction that made it to the bestseller list, although most appeared under pseudonyms. Which is all very surprising since Arthur was a slow, meticulous writer who had spent nearly a decade creating *Thunder Ridge*.

It all started when Sarah Chambers showed up at a bookstore signing.

The chemistry between them was so palpable that even casual bystanders noticed that something unusual was going on. They talked briefly but warmly, and when the signing was over, they left together. A month later they were engaged, and a month after that they were married.

All of this would have been just a nice romantic story except for one thing. Sarah Chambers was a brilliant computer programmer who owned her own laboratory, and she'd quietly developed a method of replicating human personalities in code. A year after their wedding, Arthur was halfway through chapter one of his new novel and Sarah was nearly bankrupt because she had spent too much time and money on pure research and not enough on practical applications.

"I wish I could write faster," said Arthur one day.

"Maybe you can," was Sarah's rejoinder.

They spent two weeks uploading Arthur's personality into her network. "Time doesn't have quite the same meaning in the virtual world," she told Arthur. "Your replicated personality can experience several years in what is from our point of view a single day."

A week later, they printed out the first copy of *Banners of God*, Arthur's second novel. The six figure advance restored their solvency, though just barely, but a week later *Riders of the Dawn* gave them a comfortable cushion. When

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the publisher expressed reluctance to purchase a fourth novel so quickly, Arthur sold *True Visions* to a rival house, along with his first murder mystery, *Death Trip*.

In 2006, Arthur had eight titles on the bestseller list, all under his own name.

If it had been just a matter of money, that might have been the end of it. They were already rich enough to live comfortably for the rest of their lives, even if Sarah continued with her expensive programming projects. But unfortunately, the biggest fan of Arthur Friar's writing was Arthur Friar. He had an insatiable appetite for his own work, even if it was written by his proxy self, and was egotistical enough to believe that everyone else felt the same way.

They expanded the network and replicated the Arthur module several times. A new novel began appearing every day.

Arthur expanded into science fiction in 2007, men's adventure in 2008, romance novels in 2009, young adult and children's books in 2010, and started producing film and television scripts in 2011. He had over three hundred pseudonyms and could no longer read everything that he was writing. The various Arthur modules were interfaced regularly to avoid creating duplicate work, after Sarah decided it would be unwise to assign them specialized duties.

By 2012, most of the writers' organizations had disbanded because there were so few active authors remaining, and the Friars controlled the fourth largest private fortune in the world. Sarah wrote linguistic programs for the Arthurs and in 2015 they began producing original works in Russian, French, and Spanish. By the end of 2020, writing as a profession had ceased to exist, and the few individuals who still produced fiction posted it on rarely visited websites.

Disaster struck in 2025. A technician noted that Arthur #223 had failed to produce the latest Lee Carson detective story on schedule and ran a diagnostic. She was waiting for the results when another red light appeared on her board. *Juggernauts of Saturn* was overdue from Arthur #151. Frowning, the technician started to request a second diagnostic, but a third light came on as her hands hovered over the keyboard.

Then another. And another.

The last complete Arthur Friar novel left the print queue an hour later. By then the entire board was red, and the Friars were flying back from their vacation in Baluchistan. It took less than a day to discover the source of the problem. The Arthurs all had writer's block; it had spread through the interface to infect each and every module.

Sarah tried restoring from backup, but the backup was so recent that the block returned after the Arthurs had turned out exactly the same text as on the previous day. They tried a new replication, but the organic Arthur hadn't written a word of fiction in over twenty years. His virtual copy went into block after two sentences.

Publishers began to panic. The steady influx of manuscripts had been of such high quality that they no longer employed editors. The supply had been so reliable that no one held any significant unpublished inventory. In less than a month, bookstore shelves began to empty. Reprints filled some of the gaps, but the reading public wanted new material, and there was no one left to write it. Hollywood was similarly devastated.

The world economy went into a tailspin. There were riots in most of the major capitals of the world. War broke out in the Mideast and spread throughout the world. Modern civilization collapsed into barbarism by 2030.

In the spring of 2146, Ted Graham of the Shoeless Clan set quill to parchment in a stone hut in what used to the Southwestern United States and wished that he could write more quickly. ■

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PUNCTUATED EQUILIBRIUM

Pete D. Manison

Sometimes timing is everything. . . .

The rain drummed against the roof of the car, seeming to push the Texas night even further into the distance. Kelly McAllister gripped the Nissan's steering wheel tightly. Sleep approached along seductive pathways. She deployed countermeasures—turning up the air-conditioning until the windshield started to fog, pinching herself, singing.

She mustn't fall asleep.

So when her eyelids began to droop, she let her mind touch on the thing that pursued her.

Fear did the rest.

"So that's our baby?" Kelly whistled in appreciation of the computer graphic that floated in the holodisplay. "Bigger than I expected."

"I love it when you talk dirty." Brett Sabershaw winked at her. Kelly rolled her eyes.

"The *asteroid* . . ." she prompted.

"Oh," Brett snickered, "*that*."

She thought about telling him that for a NASA engineer he made a pretty good lounge lizard, but she checked herself. That would only encourage him. Instead, she simply waited in silence.

"Well," he finally resumed, "we needed a big one for several reasons. The volume of data, even stored on the latest molecular memory cards, is enormous."

She nodded. "I imagine. We're talking about the totality of human knowledge."

Brett grunted. "Then there's the matter of shielding. The vault will be drilled out of the asteroid's core, and the surrounding rock will protect the electronics from long-term damage by cosmic rays and micrometeoric bombardment."

In the holofield, the asteroid slowly rotated, bringing into view one of the sets of maneuvering engines that would be placed on its surface. The nozzles seemed oddly out of place on the pristine cratered surface, like a formation of giant golf tees.

"Good choice," Kelly said. "The mass

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will make my job a lot easier. Deflection by outside gravity wells won't be as great a problem as I'd feared."

Brett smiled, spreading his hands. "My thoughts exactly. It was all my idea, you know. So if you'd like to make it up to me by buying me a drink after work . . ."

"Brett?"

"Yes, Kelly?"

"Shut up."

The rain continued past midnight. Kelly began to frown at the fuel gauge. Heading toward central Texas, US Highway 290 featured long open stretches of farmland with sometimes half an hour between signs of habitation. She'd have to stop at the next truck stop she saw, rain or not.

She laughed. In the cocoon of the car's interior, her own voice startled her. With all that was coming, for her to be worried about getting *wet* seemed like the funniest thing in the world.

Maybe I was wrong, she thought for perhaps the hundredth time. *Maybe I made a mistake.*

No. Woomera and Star City had confirmed the observations. And her models, as always, had tested true to within one percentage point.

"Are you sure?"

Max Warrender, Director of Project Bootdisk, frowned over the videophone at her. He always reminded her of a cross between Richard Nixon and a pit bulldog.

"Yes, sir. The models have tested true to within one percentage point. This is the optimal orbit for our rock."

Warrender shook his head. "We have to be absolutely sure about this, Ms. McAllister. The asteroid must return to near-Earth space once per century, yet never risk a collision. Run your models again, until you've got them within *one tenth* of a point."

Kelly sighed. "But sir . . ."

"Just do it!"

His scowling face vanished.

"What's eating *his* butt?"

Kelly turned to find Brett Sabershaw leaning casually against her open office door.

"I'm sure the director has a full plate," she said, turning to her keyboard and punching up the latest version of her orbital model. "Foreign governments suspicious of our requests for information on their geography and population, corporations protecting their patent rights and refusing to divulge formulas for their products. You name it."

"Hm," commented Brett.

"And the budget," she said. "Don't get me started on *that.* People want a quick return on their investment—now more than ever. It can't be easy getting them to open their wallets for a project that will only bear fruit when and if our current civilization collapses."

She felt breath on her cheek. Brett had come up behind her and was studying the animation on her screen, which showed the asteroid/knowledgebase tracing out its elliptical path around the sun.

"You sound like you have your own reservations about the project," he accused.

She shivered with disgust. "What did you have for lunch?"

"Ms. McAllister, I'm sensing resistance here."

She shrugged. "Oh, it's a very high-minded idea. That's what attracted me to the project in the first place. You've got the Terror War. You've got TB-Prime. You've got the rising sea levels. Any number of threats to the stability of our civilization. Sooner or later, it likely will collapse. There'll be another Dark Age."

"And our Bootdisk will be circling around up there, passing by every hundred years, ready to radio down all the knowledge they'll need to rebuild."

"You toe the party line like a trained porpoise," she told him. "But you're an engineer, not a sociologist."

Brett snorted. "Oh, I forgot. Our world-famous computer modeler moon-

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lights as a head-shrinker."

"Don't change the subject. You have to know that dumping that much information on a civilization in one lump will lead to all kinds of chaos."

"Sure. The knowledge could fall into the wrong hands. Wars could be fought to acquire it, to manipulate it. Controlling its dissemination would be impossible."

"You said it. Chaos. War. We'll be giving advanced knowledge to people who haven't taken the intermediate steps, who don't have the slightest idea what to do with it."

"That old argument again?" Brett shrugged. "You're focusing too tightly. So there's anarchy for a generation or so. Who cares? When it settles down, they'll have a better world."

Kelly sighed. "I'll tell you who cares: the people living in that one generation."

She did get wet. In fact, she got soaked. The truck stop had been on the wrong side of the highway, and the country store that was its westbound counterpart had no awning over its solitary gas pump.

It didn't matter, she told herself. At least the chill from the rainwater cut through her drowsiness. She still had a long drive ahead of her. She'd leave the main highway on the far side of Austin, before she reached Fredericksburg. From there the back roads of the hill country would take her farther and farther from civilization.

Which was, of course, the whole idea.

"Suppose they blow themselves so far back they don't even have radio?"

Another week of work on the model. All that remained was to download the latest astronomical data from the Hubble and other orbiting telescopes, to verify that no other celestial body crossed the proposed orbit for at least ten thousand years.

"It's all built into the plan," she assured Brett. His work on the memory bank design had been completed, and he'd taken a suspicious interest in her sociological take on the project. Probably reporting every word back to Warrender, Kelly mused. She hoped so. The nearer they got to completing the planning phase, the more she wondered if the project had not been ill-conceived from the start.

"Explain," ordered Brett.

She clicked on the Hubble data, entered her NASA employee identification number and password, and waited for the download. "Simple. The asteroid passes each hundred years, right? It washes the Earth in radio waves, communicating everything from the history of space flight to the design specs for a nuclear power plant. If the inhabitants of Earth don't even have radio yet, they probably aren't ready for the rest of it."

"I *guess* that makes sense."

"Sure it does. If they're not ready, they get another century before the next pass. It's the timing that bothers me."

"Timing is everything," Brett agreed.

Kelly arched an eyebrow. "I hadn't noticed it being your long suit."

"Ouch. Okay, enlighten me."

She checked the download. Fifty percent complete. The progress bar moved with interminable slowness.

"You've heard of punctuated equilibrium?"

He nodded. "Biospeak, right?"

"Evolution theory. According to the model, long periods of virtual stasis in living things are interrupted by brief intervals of rapid mutation."

"It's quiet for a while, and then all hell breaks loose."

"Exactly."

"And what has this got to do with our asteroid time capsule?"

"Everything. The same principle could be applied to human societies. What happens if they're already in the midst of a rapid-change event when our Bootdisk swings by with its flood of in-

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formation?"

Brett looked doubtful. "The odds are way against it."

"But what if?"

He looked thoughtful. Was she getting through to him at last? "Information overload. We could be the catalyst of the very collapse we're trying to help them recover from."

"Exactly. And what we don't know—"

She broke off as the computer chimed to tell her the download was complete. One glance at the data was all it took.

"Oh, my God."

She pumped the brake and brought the Nissan to a sluggish stop.

"Bridge out, Lady. You'll have to go around."

Kelly squinted. The rain had let up a little, but it was still coming down as a steady drizzle. Through layers of grayness she could just make out the swollen creek, like a fat worm crawling across the road up ahead.

"How do I get through?" she asked.

The state trooper glanced at the back seat, and she noted his quizzical expression. She'd packed the Nissan to the ceiling with her belongings—everything she could carry, everything she would need.

"Go back about two miles. You'll see the detour. Just follow the signs."

She smiled, embarrassed. "Thank you, Officer. I guess I missed it in the rain."

He tipped his hat to her. "Have a safe trip, ma'am."

She rolled up the window, put the Nissan in reverse, and turned around. A safe trip. She stifled a laugh. She'd probably outlive the trooper by decades.

"Are you certain? There's no mistake?"

Director Warrender had flown down from Washington D.C. as soon as she'd vidphoned him with the news. She'd expected him to be shaken, troubled by the implications of her find. His manner, to her surprise, was of barely contained excitement.

"No, sir. No mistake. The body is on the exact orbit we planned for Bootdisk. It cannot be a coincidence. This is one of the few possible orbits that fit all the parameters. It brings the body near Earth every ninety-seven years, with no risk of collision projected for at least one thousand orbits."

"And it can't be a natural object?" Warrender asked. "A comet, maybe?"

Kelly shook her head. "No, sir. It does show up in the Chinese observation records, but it's no comet. It's hot in the radio. It's already begun broadcasting."

A Bootdisk from the past, from some ancient high civilization that had fallen deep in Earth's past. Forgotten. They'd had the same idea to pass on their knowledge to a future world, and they'd actually *done* it.

"You realize what this means," Warrender said. "The committee is already in session. When I return to Washington, I'm going to recommend abandoning our current project and shifting all our resources toward receiving and processing the data from this artifact. This means a new golden age for humanity. Who can imagine the secrets we'll learn?"

"Sir," she began, "I've been doing some thinking, and I'm not so sure . . ."

He dismissed her with a wave of his hand. "Mr. Sabershaw has informed me of your concerns. Rest assured, Ms. McAllister, we will make the best possible use of whatever information we receive from the artifact."

"But sir, how can we know—"

"And I'm sorry to inform you that with the shutdown of this project, your services will no longer be required."

"What? Surely you can't be serious! We have to model this, study it, determine whether we should risk—"

"Ms. McAllister, have I suddenly developed a stutter? I said you're fired. We don't need you any longer, and quite frankly I don't like employees who ques-

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tion my decisions. Your contract termination clause entitles you to a month's severance pay. You have one hour to clean out your office."

It took her only twenty minutes. The rest of the hour she used to run one last computer model. When she was satisfied as to its accuracy, she allowed herself a tight little smile. Forewarned was forearmed.

She headed home to pack.

The rain had finally stopped. As Kelly pulled the Nissan up the gravel drive, the clouds parted to reveal a bright, moonlit sky. She parked in front of the cabin and set the brake.

It wasn't like she'd abandoned them, she told herself as she opened the door and stepped out onto the rain-soaked rocks. She'd shown Warrender and Sabershaw her model, explained to them what it meant. The human race was at a punctuation mark in its history. Change and instability characterized everything: economics, politics, even the environment. This was exactly the *wrong* time for the arrival of a Bootdisk.

They'd laughed in her face, drunk on the promise of glory. The discovery of the artifact would get them the headlines, no doubt of that. But very soon thereafter the headlines would have other things to report.

She'd be safe here. Her model had predicted the areas of greatest danger—the cities, the coastlines. She'd thought of the cabin at once. It had been her uncle's, left to her in his will. He'd built it in the '60s, during the height of the fallout shelter craze.

Yes, she'd be safe.

Here in the rocky hill country, she could fish and hunt, grow what vegetables she needed, keep a low profile. And when the world hit the fan, her shelter would be well stocked and well concealed.

Kelly opened the back of the hatchback and started to unpack. As she carried the last load into the cabin she paused to look up at the night sky. There, to the left of the moon, was where it would appear. A bright new star. Soon. For only a brief little time. If she squinted, she could almost see it now. ■

I refuse to accept the idea that the 'is-ness' of man's present nature makes him morally incapable of reaching up for the 'ought-ness' that forever confronts him.

—Martin Luther King, Jr.

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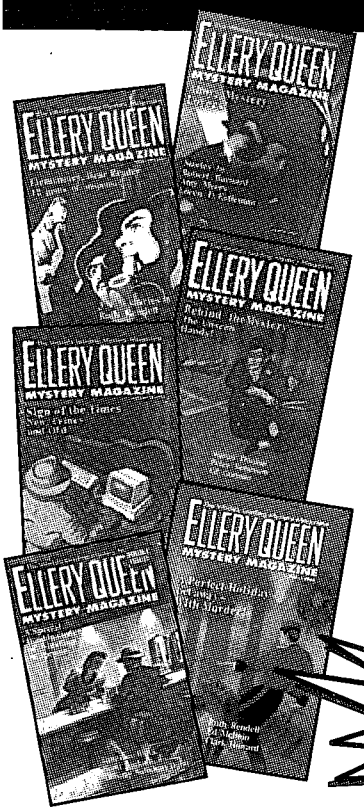

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Aloha

Ken Wharton

Maybe life *isn't* a one-way street. . . .

In their final moments together, as Hannah was about to convert, she treated Felix to a new sort of vista.

They were on a beach; that much was familiar. But the surrounding flora and fauna looked completely alien: towering cylindrical trees, sprouting leaves from only the very tops; other trees bearing spherical objects (fruits? nuts?) with colors Felix had never seen in nature; flying animals with ridiculous feather patterns and strange, pointed beaks.

Hannah, who usually chose familiar scenes from their distant past—except for that one abstract period 10^{80} years before—was clearly starting to lose her volition.

"Why this?" Felix asked her as they walked side by side in the warm, white sand. "And why this colorful skirt?" He almost mentioned the alien flowers around her neck, but didn't want to bombard her with too many questions at this difficult moment.

Hannah visibly struggled to respond. "I can think of some plausible reasons," she said. "But given what's about to happen, they're probably just rationalizations. What does it look like to you?" She opened up a bit of her soul—a rare, but not unprecedented event—and Felix examined her as closely as he dared.

"I think you're right," he said, staring into her as if he could memorize her nature, as if he could keep the parts he loved, to fend off the impending loneliness. "Future conditioning, I suppose."

She closed up to him, for the last time, and they resumed their walk toward the surf.

"I don't want to end," Hannah confessed. "I almost envy you."

"What's to envy? I'll be alone."

Hannah shrugged. "At least you'll *be*."

Felix didn't know how Hannah could see any comfort in what he would have to endure. His fate was set by the laws of physics, without hope of reprieve. He would live out his remaining time alone, and then he would end, a cause without an effect. And with this hopelessness on top of losing Hannah. . . .

Felix finalized his decision. "I'm going to change, once you're gone. I've fashioned a block. To stop me from thinking about what happens after I end."

She smiled her most sorrowful smile, and Felix couldn't believe that any future conditioning could be affecting *that*.

"The last man in the universe, and he

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won't consider the future."

"I don't want to endure it. And I don't see what harm—"

"Well, *I'm* considering the future. What's the time-reverse of a broken heart?"

"After you convert, you'll see one right in front of you."

The waves lapped their bare feet for a timeless moment, but a dead calm soon fell over the ocean and even the tiniest ripples vanished.

"I think it's about to happen." Hannah lowered her head to watch her feet sink into the damp sand, air bubbles popping up around them. Then she looked up at Felix. "To think of all that time we forwarded, not knowing how little we had left. And now I'm left with no time to even remember this . . ."

"I'll remember it for—"

Felix broke off, realizing it had already happened. Around him, nothing had changed. Hannah's beach was still intact, and Hannah herself had barely moved. But that was expected—indeed, *required*. This may have been Hannah's causal end of the universe, but the physical laws of conservation demanded a momentary convergence between the Hannah from the past and the stranger from the future.

Already changes were becoming apparent to Felix, already the histories were diverging. It was more than just the jerky and unnatural motions from this woman in front of him. It was the way she looked at him. No longer could he see the love they had forged over nearly half the duration of the universe. But he didn't see the look of a complete stranger, either. In fact, Felix imagined that she looked eagerly expectant.

But expectant for what? This stranger was nearing the end of *her* causal existence, too. A few moments into her subjective future—a few moments into Felix's past—this woman's consciousness would cease as she merged with Hannah. All of her memories would lose their context, all of her history would be sequestered in an unknown future. In a very real sense, this woman's universe was about to end.

The woman awkwardly grabbed his hands. "Aloha," she intoned, some word in a language he did not know. Then she let go, backed away, and kept walking backward down the beach.

It was over, and Hannah was gone. He didn't feel anything yet—it still didn't seem real. Not with Hannah's double smiling at him from the distance.

Smiling? Surely this woman couldn't be expecting some version of an afterlife. Anyone who had survived to the temporal midpoint of the universe had to know that their time was quite literally up, had to know that cosmological boundary conditions imposed the same time-symmetries on the universe that were found in the laws of physics. The artificial atoms that comprised her computational structure would survive, but the causal chain of her life was about to terminate.

Felix quickly turned and left the beach, flashing back to his most comfortable base-state. In a moment he found himself resting on familiar mosslands, directly between the double shadows of his ancestral mountain peak. And it was only then that he realized the woman might not even know what was in store for her.

By now Felix knew his own fate, without question. His friends and acquaintances had converted, one by one, and now he was the last of his kind, maybe the last entropy-increasing consciousness *anywhere*. But from the woman's temporal perspective, she would be almost the *first* to convert. Maybe she didn't know. Maybe she didn't understand.

Maybe he should talk to her.

Felix pushed that last thought away. Hannah was gone, and he needed to begin dealing with that fact. Inventing excuses to interact with her double was not what he needed right now. Interacting with *any* time-reversed person was

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difficult enough.

Felix had spoken to some of them already and had learned their primary language, backward sentence structure and all. But he had also learned how unwieldy it could be to hold even the simplest conversation. What do you say to someone who has already heard everything you'll tell them from that point onward, but doesn't remember anything you've already said? What's the point in communicating, when by expressing an idea all you accomplish is to erase it from the other's memory? Throw in the feeling of being manipulated—even though the only "manipulators" were the unfeeling laws of physics—and Felix had long ago sworn off any more mixed-boundary conversations.

No, there was no point. Hannah was gone, and his destiny was meaningless. Soon he would be no more able to affect the future than he could affect the past. Feelings of depression and loss were already closing in when he remembered that he had never activated his block.

In a moment it was done. And he did feel better, in some ways, though the emptiness in his heart now seemed even more pronounced. Felix still knew his time was limited, but with Hannah gone that almost seemed like a good thing.

But how much time did he have remaining? None of the other time-reversed people had been willing to tell him when he was due to convert, but today a new source of information had appeared. He might give this Aloha woman a chance to tell him. . . .

Soon, Felix told himself. First he needed time to mourn.

He approached the woman on her simulated beach. The vista had changed somewhat from his previous visit—the waves were moving offshore, for one thing—but the general feel was the same.

Seeing her again was more painful than he had expected; she still looked too much like Hannah. Her eyes searched his face, as if examining the remnants of his love.

"I don't know what to say," he began, careful to speak backward so she could understand.

"No, I don't suppose you do," she said dourly. Felix blinked. She made perfect sense, almost as if she were responding to him. But that would be impossible. . . .

She brightened. "Aloha, remember?"

Felix nodded, then stopped himself. This woman was experiencing causality in the opposite direction; responding to her would do no good at all. Neither would asking her questions. He mentally reversed the order of her last two sentences, and realized that she hadn't responded to him, but rather to her own rhetorical question.

"It's hard for me to see you like this," Felix said.

Now she looked impatient. "I really wish you'd stop talking about those things."

Her impatience was infectious, and Felix launched into his prepared speech. "Look, I only have one thing to tell you, but it's important that you know what's happening. Surely some of you have observed that the universe is reversing its causal arrow. We first noticed it ages ago, long before anyone converted."

In fact, Felix had been one of the first to notice. The computations that enabled their continued existence had long been powered by the only energy source left in the universe—the occasional annihilation of electrons and positrons into two energetic gamma rays. Not even stray protons were still around to supply energy; apart from the ones they manufactured, protons had all decayed into positrons and other unstable products long ago. The energy supply dropped with time, constantly slowing down their conscious processes while making the rest of the universe appear to speed up. But Felix had noticed that their energy supply was falling faster than theory predicted, and soon it

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had become clear that the universe had thrown them one final twist.

"I'm sure you've noticed that there's a missing gamma ray component. Well, the gamma rays are *converting*. Instead of being governed by their past history, they're becoming governed by a causal chain in the opposite direction, coming from the future. Two converted gamma rays—against all respectable odds—will just happen to collide to produce an electron-positron pair. It doesn't happen everywhere at once, because that would require an additional level of coincidence, but the process is inevitable. The universe is starting to fill back up with matter, *converted* matter, matter with an opposite entropic arrow of time. Next, electrons will start 'undecaying' into antiprotons . . ."

Her look of impatience slowly vanished as he spoke, and Felix trailed off as he realized that he had just un-bored this woman with all his talking.

"Is that right?" Emotions flew across her face with such rapidity he could scarcely imagine what she was thinking.

"The point is," Felix said, "*you* don't have much longer. You'll convert at our next meeting."

Now she seemed calm again. "I thought you were going to stop coming to see me."

Felix took a step back in surprise. He had already decided that this was to be the last time he spoke with her. So why would she say this? Unless. . . .

He took another step backward, and then another, and finally turned and ran out of her control zone. *I won't come back*, he told himself, despite the fact that the universe had already determined that he would.

The funny thing about free will, Felix thought, was that it always maintained its own illusion.

Aloha (for that was what he had named her) had implied that they had met several times in her past—in Felix's future—so now he knew something about the choices he would soon make. In a universe where free will reigned supreme, it would be a simple matter to create a paradox. Felix merely had to choose not to see Aloha again, and the universe would be inconsistent.

He laughed out loud at the idea. As if *he* were more powerful than the universe.

No, paradox-prevention had turned out to be a major underpinning of reality, the lynchpin to explaining why quantum mechanics worked the way that it did. He couldn't force a paradox, no matter how he tried.

But neither did the universe force *him*, manipulating his actions like a marionette. Physics was subtler than that, and the illusion of free will was infinitely resilient. He knew that he would eventually come to an apparently free decision to go see Aloha. And this was why he loathed these mixed-boundary encounters so intensely. Because, in the back of his mind, he'd always know that it wouldn't *really* be a unilateral decision, that it was forced upon him by future events.

And so his stubborn streak kicked in. *No free will? I'll see about that.* And he resolved to make the universe drag him into Aloha's zone, kicking and screaming. Never again, Felix vowed, would he go to visit her.

Instead, the universe brought Aloha to him.

Felix could have excluded her from his zone, but he was so stunned by her appearance—not to mention her wounded expression—that he didn't think of it until it was too late.

"What are *you* doing here?" he blurted out.

At that, Aloha's expression cleared, she sat down on the mossplants, and began to talk.

It was a rambling tale, as one would imagine, given that every thought logically preceded the one before. But over the next subjective hour, Aloha still managed to paint a picture of her home

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planet, her fleshlife, her culture.

Despite the recurring ocean scenery, Aloha claimed that she hadn't spent much of her life on the beach. Instead, she had lived her fleshlife in the mountains—much like Hannah. And the similarities to Hannah went well beyond that. Both had been the first in their family to transcend, both had a rather morbid sense of humor, both were absolutely brilliant mathematicians.

There were differences, too—after all, they had led entirely different lives on different planets. But the coincidences did make him wonder: How much of Hannah was still lingering inside this woman? If Aloha's influence could reach into the past and make Hannah produce an alien beach-scene, why couldn't Hannah's influence be reaching here, into the future? Maybe he hadn't lost her; not entirely.

Aloha's stories ended before Felix was ready, and asking her to continue would accomplish nothing. She got up to leave, smiling.

"Then I think it's my turn, this time," she said.

"I enjoyed that," was all he managed, before she flashed away. Felix stared at the spot where Aloha had just stood. "Very well," he muttered into the emptiness. "Free will be damned."

They met often. Sometimes in his zone, sometimes in hers, but always the routine was the same. One of them would talk, and the other would simply listen.

When it was his turn, he talked about whatever came into his head, bouncing randomly from his childhood to his final days with Hannah and everything in between. Aloha seemed to especially enjoy it when he talked about Hannah—or perhaps he just tended to bring up Hannah when Aloha looked cheerful. By this point, Felix had effectively given up on separating cause from effect.

Aloha rarely talked about her recent history, but it was clear that she had a life partner, too. Unlike Felix and Hannah, they weren't the last of their kind, but love was love, even when time-reversed. Felix saw no evidence of this other person, and that made it easier to imagine that whenever Aloha talked about her partner, it was really Hannah's influence reaching into the future and telling Felix how she felt about him. Even though Aloha sometimes went for entire conversations without even hinting that this other person existed, her casual comments on that topic kept Felix coming back for more.

One day, when he went to see her, the beach was gone. Now Aloha's zone had become a mountain scene in spring, just below the snowline. Thin white trees surrounded them on all sides, sporting small leaves that had wildly different shades of green on either side. Aloha looked the same, apart from her warmer clothing, but somehow Felix knew that this visit was going to be different from all the rest.

Upon seeing him, she smiled sadly and shook her head. "I guess 'Aloha' was appropriate, after all." Felix sat beside her on a fallen tree, waiting for her to say more, but today she remained thoughtfully quiet. Still, Felix hadn't made it to the temporal midpoint of the universe without learning a great deal of patience, and he waited her out.

At last Aloha began speaking again, but this time it wasn't a story about her distant past. Something, it seemed, had opened her emotional floodgates, and Felix sat in stunned attention. Instead of her usual reticence to talk about her partner, the words that came pouring out were almost beyond what Felix could handle. She spoke of her timeless feelings for a love who was no longer with her, feelings that Felix couldn't help but identify with.

"I miss him so," she said, shaking. She wiped her cheeks, smearing moisture onto them. "I mean . . . I mean . . . I miss *him*." Now she was crying, and Felix could almost see Hannah inside of her

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rising tears. "I miss you."

Felix caught his breath. Was Hannah speaking to him directly, one last message from the past? He reached out to her with both arms, and after a tiny hesitation she entered into his embrace. They clung to each other, all the while Felix knowing that this was as close as he'd ever get to a final goodbye.

She disengaged from him quickly—too quickly. Felix almost felt betrayed as he looked into her moist eyes, despite the fact that they were looking back at him with real love.

"You're Hannah, you know," he said, the words that he had been holding back finally tumbling out of him, almost beyond his control. "I never told you, but that's why . . . that's why I've been coming to see you. When Hannah converted, she merged into you. And I loved her so much I can't seem to let her go."

Aloha's eyes were now clear. "Why are you doing this to me?" Her voice was weary, a side of her he had never seen. "Just stop this."

"—you coming to see me."

She interrupted him before he could begin his sentence. "Next time I'm going to exclude you," she said. "Don't come here anymore."

But you're not going to exclude me, Felix thought. In fact, from her time-perspective, she would soon decide to visit him regularly. Something had changed in Aloha today . . . but what? Did she *want* him to imagine that she held a little bit of Hannah inside of herself?

She glared at him. "I don't want to see you."

Whatever the reason, she no longer felt the same way. Out of deference to her current wishes, Felix retreated from her zone.

His next visit was not from Aloha, but from a dozen of the other time-reversed people. He had talked to some of them before, but never in a large group like this. And of course, they wouldn't yet know about those previous conversations.

Felix met them just outside his personal zone. They stood together in a group and eyed him as they might a dangerous animal.

"Like when we're all going to die," said the stocky, bald man who had converted from his old friend Nemo.

"Just imagine what he knows," said another.

"I don't like where this is heading," said the only woman in the bunch.

After more random comments of this sort, several of the others started laughing at Reverse-Nemo, who was sporting a grim face and looking down at his empty, cupped palm. A small device materialized there, and Felix watched as Reverse-Nemo lobbed the device towards him in a perfect, parabolic arc.

Felix quickly decided not to catch it, wondering how this would look from a reverse-time perspective. The arc would have the same shape forward or backward in time, like all the laws of physics. But Reverse-Nemo hadn't *thrown* the object, he had *caught* it. If the device went clattering on the ground behind him, then how would it have—

As if by reflex, Felix reached up and snagged the device out of the air. Reflex? Or forces beyond his control? He was just starting to puzzle out what had caused the device to pass between them at all, when suddenly the device *spoke*.

"Say 'rhinoceros' and give this back to me," the device said, and Felix noticed that the others had stopped laughing.

Felix shrugged, repeated the nonsense word as best he could, then lobbed it back to Reverse-Nemo's hand.

Now Reverse-Nemo's grim look was replaced by open skepticism, and the device vanished just as it had appeared.

"Watch this," said Reverse-Nemo. "I think he's a fraud."

Now they all started talking at once, crowding around him.

"It's not just the gamma rays. What have I been telling you?"

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"Impossible."

"It finally happened."

"What's going on with you?"

Felix wouldn't have been surprised if they had started prodding him. They had clearly never seen him before, never interacted with a time-reversed person at all. But Aloha hadn't treated him like this at their last meeting, which meant that they'd see each other at least one more time. So where was she? He made one last check for her face in the crowd before retreating into his zone and raising a full exclusion.

His time was almost up. Felix had suspected this before now, but the strange visit from the others confirmed it. Next would no doubt come the rationalizations.

Forced consistency was tricky business for the universe. With two symmetric boundary conditions on its temporal extremes—one at the Big Bang and another at the Big Crunch—the universe was a classic case of an overconstrained system. While this meant that the universe lost many of its degrees of freedom, this had usually been irrelevant to Felix, changing only the microscopic details of his quantum state, not the overall picture.

But now everything was different. Now the universe needed to control every detail, every decision he made, all in the name of paradox prevention. And the universe determined that Felix would decide to go visit Aloha, one final time.

Felix knew it must be a rationalization. While he could imagine some possible reasons behind the decision—he didn't want to be alone, he missed Hannah, etc.—deep down he knew he was being swept along by circumstances beyond his control.

Even so, the act of actually going to visit Aloha seemed perfectly natural, in accord with his usual perception of free will. Aloha didn't exclude him—somehow he had known that she wouldn't—although she looked rather despondent as he approached.

I should be the one feeling despondent, Felix thought. *It's my world that's about to end.*

"I don't know why we're even talking," she said, leaning toward him. "This is ridiculous."

"I've been lonely. I was hoping you'd tell me another story."

"You have no idea how hard this is."

Felix fell quiet and sat down, hoping that she'd speak to fill the silence. Instead, she slowly began to cry.

"Something's about to upset you," Felix noted out loud, talking more to himself than to Aloha. "And I don't imagine that it's because I'm about to walk away."

"It's a word that means both goodbye and hello," she said in one of her usual non-sequiturs, now crying harder than ever.

"I don't understand, Aloha," he said, slipping up by calling her that made-up name for the first time. "Help me understand."

But already the tears were slowing, Aloha now looking more withdrawn than sad.

"This *is*," she said. "This *is* impossible."

"I wish it *was* impossible." Felix shook his head. "But I'm afraid it's all very real. We're *never* going to be able to have a conversation, don't you see? One of us has to just *talk* to the other, like we did before. And it has to be your turn. I don't want to spend my last few moments talking. I just want to be with you at the end."

"Please go away. Go away. I can't bear to see you like this." But despite her words, she looked deep into his eyes.

"I feel the same way, but I still can't leave you."

"Can you hear me? Are you still hiding in there, somewhere?" She blinked her moist eyes. "Oh, my love."

Felix felt a virtual pang in his virtual heart. *Love?* In their last conversation, she said that she missed him, and now

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she was professing her love? If Hannah was talking through Aloha, her influence should be getting weaker with time, not stronger.

Something didn't add up. What was happening here? The answer should be obvious, and if he couldn't see it. . . .

His block.

Something about his block was preventing him from making the final connection.

Aloha—Hannah—was pleading with her eyes.

"You always were a purist," Felix muttered, and he whisked away his block before he could change his mind. Immediately a dozen thoughts surged to the forefront of his consciousness, clamoring for attention.

For the first time since Hannah's conversion, Felix considered his own fate. Somewhere in the far future, he recalled, some time-reversed intelligent creature would be living on a planet orbiting a time-reversed star. That creature would transcend—just as Felix had—and would help construct a computational structure remarkably similar to Felix's own. Its subjective experience of time would slow down as energy sources became rarer and rarer, but it would survive to the temporal midpoint of the universe. And as the two of them approached the same space-time point from opposite temporal directions, the universe was forced to make them converge. Their lives were intertwined along the same standing quantum waves, and these final moments would only serve to make the universe free of paradox.

But that line of thinking held an important fact: When Felix converted, he would be replaced by another. He had considered this before, but now he had new information. Now Felix knew exactly who he would become.

"You can't leave me alone like this," Aloha said, almost begging. "You can't be gone."

It was all very clear. Aloha was reliving Felix's earlier loss in reverse. Felix had the most intense feeling of déjà vu he had ever experienced, and it kept getting stronger, almost as if he was a character in a pre-scripted play.

"I've left you," he said. "I'm so sorry."

He forced himself to think backward, from Aloha's perspective. She'd soon terminate by converting into Hannah, reuniting their universe-spanning love after this brief off-sync interlude.

A smile began to creep across his face as the corollary of that thought sank in.

Yes, his existence was almost over. But when he converted, he'd be back together with the woman he loved.

Aloha's tears had vanished, replaced by a look of pure shock.

"Are you gone, like they were warning us?"

And *that* was why, Felix realized. *That* was why Aloha had been happy at the end of her existence. That was why she smiled. She knew that they'd be reunited—in a fashion.

But why did she say "Aloha," at that final moment? What did it mean?

"I don't believe it," she said.

And then he realized that she had already answered his question.

"Aloha," Felix responded through sudden tears of joy. "Aloha." ■

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BY THE RULES

Edward M. Lerner

Behavior is determined by rules—but not even the person following them is always sure what the rules really are!

If one were to mathematically analyze the timing of major life decisions—not that my interests run to quantitative studies—I theorize one would find a statistically significant clustering at multiple-of-five birthdays. (If Dad heard that prediction, he would, without missing a beat, ask if I was referring to integral multiples of five. You can imagine what a trial my childhood was.) The speculation comes to mind because this all began on my twenty-fifth birthday. A quarter century: it had struck me more as a substantive fraction of a lifetime gone than as a cause for celebration.

My friends, however, were of a different mind.

At State U., even in the sociology department, a Taco Bell run was considered a multicultural experience. I'd ranted about the local ethnocentrism often enough, so I was delighted and touched when my friends surprised me with a Japanese night out. We're all impoverished grad students, so here "out" meant gathering in one of their apartments. How ironic was it that one of the few times they were game to try something not remotely a hunk of corn-fed Midwestern beef, they picked my least favorite cuisine? The *sushi* wasn't a problem, however, as there was plenty of *saki* with which to swig down the raw eel and yellowfin and squid, not to mention several items I didn't recognize and decided not to ask about.

How different things might have been if only I'd masked the food with *wasabi* mustard instead of the rice wine.

Everyone had brought foodstuffs in my honor, so I had to sample it all. Japanese etiquette, my hostess gleefully informed me, required downing each cup of *saki* in one swallow—and she owned water tumblers, not delicate ceramic cups. By my third California roll, I was feeling no pain. Halfway through my gastronomic survey, I was improvising paeans to diversity. No one even tried to match drinks with the birthday boy, but we all got pretty damn mellow.

What came next seemed like a profound idea at the time: *very* multicultural sociology. I remember plopping myself down in front of a computer, and the gales of laughter as I almost toppled off the chair. I remember guffaws at my

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typos and boisterous negotiations over wording. After a ceremonious clinking, but rather more like clanking, of cheap glassware, I recall clicking SEND to dispatch our masterpiece. Lost in an alcoholic fog, however, was the exact topic of our enthusiasm.

The project about which we had all been so enthusiastic was only a vague recollection when I awakened the next day, head throbbing and tongue furred. My only clear memory beyond dissolving raw fish in alcohol was the sadly dead-on caricature on my birthday cake: the head of a young Woody Allen on a tall and gangly frame. The phrase Ichabod Cranium flashed through my mind—I could only hope *that* thought had gone unarticulated.

Someone had brought me home, gotten me undressed and into bed. My bedroom faces west; the sunlight streaming through a gap between my drapes showed it was late afternoon. If the punishment fit the crime, I had *really* enjoyed my party. I was pondering the wisdom of getting up when a roadrunner -like "me-meep" made my skull resonate. Email.

I stumbled past my PC on my way to the bathroom. The subject line of the newest message brought a shock of memory. It was a reply. "Please, no," I croaked.

Please is not always the magic word. It appeared that the *Journal of Emergent Sociology* was facing a last-minute delay in the delivery of an invited paper, and so had a hole to fill in the upcoming quarterly issue. They couldn't promise publication, of course, but would look favorably upon a timely submission along the lines of my overnight emailed proposal.

I scrolled down the message to see just what I'd suggested in my drunken stupor. Reading, my stomach lurched.

My father hoards speech as if words were being rationed for some war effort, a miserliness that manifests itself both in vocabulary and brevity. As to the former, I'll offer only an example: I knew the word *vehicle* before car, plane, or boat. How odd is that? As for the latter, there's a reason my sister refers to Dad as Professor Cryptic.

Before and since my teenage years, I've found his economy annoying, but it gave rise to what, entirely in hindsight, I recognize as a valuable aid to my ability to reason abstractly. My own spend-thriftness of utterance (and any social skills I may have) I learned from my mother.

"Brian, Rule One," Dad would call parsimoniously, without glancing up from his newspaper. I was left to translate for my uninformed friends: if it shakes the house, don't do it. Rule One actually made a lot of sense for little boys. It had no loopholes.

Rule Two, which is what had me reminiscing about childhood regulations, had been pretty much ignored at the recent party. Think *before* you do things. Rule Two was promulgated long before I was of an age to drink, so Dad had never derived the obvious corollary: avoid important decisions while drunk and unable to think. (He would surely have shortened that. "Don't drink and think," sounds about right.)

The paper I'd envisioned, in that *saki*-sodden stupor, involved those whose interests were *really* multicultural. As in: people enticed by cultures that weren't even human. I'd somehow been egged on in my drunken state to propose a sociological analysis of UFO—pardon the judgmental expression—nuts. There were more than enough Internet chat rooms in which such people congregated for me to easily do a study. The problem wasn't a lack of raw data, but the probable consequences of publication. The mind reeled at how such a paper would be received by my fellow academics. Yes, a few sociological papers *did* exist about UFOs and, excuse me while I throw up, ufologists . . . but those were by safely tenured faculty. My thesis advi-

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sor/mentor was not yet tenured; my highest priority was not being laughed out of renewal of my paltry fellowship.

Retracting my proposal could only draw more unwelcome attention to myself. Plan B, once panic receded, was the old switcheroo. I'd produce a paper that, while nominally consistent with my mercifully brief emailed abstract (how desperate *were* they for material?), was largely off the UFO topic. I'd reference the nuts, I decided, far less for what they believed than as a population across which to study the dissemination of ideas. My spirits lifted as the paper took form in my mind's bloodshot eye: stolid, stilted, unassailably academic and unremittingly boring—as removed as could be from the sensationalism implied by the drunken abstract. With luck, the full paper would be rejected. Even without luck, I was going for something wholly forgettable.

My field and my passion is discourse analysis, a perspective at the intersection of literary studies, history, and traditional sociology. (Dad once made mention of roadkill at said intersection, but I refuse to go there.) The little-green-men believers were as valid a population as any for the study of vocabulary propagation and transformation. That is, I could extract trends and patterns in metaphors, themes, and figures of speech, then extrapolate to the social forces causing and caused by that imagery. Or I could go all simple and mechanical (and, truth be told, more safely dull). That would place the prospective paper in the entirely traditional and noncontroversial sociological mainstream of content analysis: categorizing the topics within the text samples.

A few nights spent lurking in chat rooms yielded plenty of themes to be examined. Skinny gray men, it turned out, rather than little green ones. Evolutionary convergence, to explain ET's humanoid appearance. Alien secrecy. Government cover-ups, usually involving men in black. (Why always men? Sexism among ufologists could be another paper. I sternly dismissed that thought as an avoidable distraction.) Flying saucers: disk-shaped vehicles, when posturing to sound objective, or solid light—can you say oxymoronic? The ever-popular, if hard to justify, abduction claims. Ridicule factor, a self-fulfilling rationalization for the paucity of credible evidence. Luminous energy display. Arguments among proponents of saucer-borne beings, interdimensional entities, and time travelers. Harder to process than the patent silliness were the scattered occurrences of logic.

One reason I was thinking of my parents, I knew, was the too-long unacknowledged happy-birthday recording they'd left on my answering machine. Admitting to myself that there was another explanation, I dialed my father's office.

I'm more than a little bit murky about the types of physics. I didn't know if what Dad did had any bearing on my problem—but I couldn't say that it didn't, or if that which I was pondering related to the even more abstruse arcana he collected on his own time. After a few pleasantries, I cleared my throat. "Say, Dad, are you familiar with Drake's Equation?"

"Drake's Equation," repeated Dad. His manner toggled to pedantic mode within two syllables. "A model for approximating the number of technological civilizations in the galaxy. You estimate the stars in the galaxy, the fraction of those stars with planets, the fraction of those planets giving rise to life, and so on. You make up most of the numbers, so the equation 'proves' whatever you want about the prevalence of communicating ETs."

The chat-room denizens who had struck me as most thoughtful used—with what degree of justification, I could not say—values that predicted interstellar contact was entirely implausible. "And Fermi's Paradox?"

"Who are you really, and what have you done with my son?"

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I repressed mild irritation; Dad had every reason to be surprised by my questions. "Do you know?"

"Yes."

What I took to be pencil-on-desktop tapping noises emphasized the pause at the far end of the line. He was no doubt stymied by the futility of drawing me a picture. It hadn't taken me long, growing up, to crack the code of, "This will take pencil and paper." It meant: here comes more information than I would ever want to know (or could hope to process). Pencil and paper also had going for them, at least in the eyes of Professor Cryptic, that whole picture-is-worth-a-thousand-words thing.

Eventually, Dad found his tongue. "The galaxy is a big place, so it seems improbable Earth has the only technological civilization. Now, assume there are others. Spacefaring aliens would colonize nearby solar systems. In time, those settlements would mature to repeat the cycle. The numbers you invent this time deal with how quickly the colonists fill their new homes and the speed of starships. The values you pick don't much matter. In a few million years, a cosmological eyeblink, any such aliens fill the galaxy. So, asked Fermi, where are they?"

"Cleveland?"

"I taught you well," Dad chuckled. "Brian, why these questions?"

My answer, if incomplete, was truthful: I was researching the propagation of vocabulary in certain chat rooms. I had, in fact, already web-surfed my way to definitions of the terms about which I'd asked Dad. What I had not known was whether the sites at which I found my answers were just a less overt sort of crackpot destination. The hidden agenda of my call was to hear if a serious 'hard' scientist took these ideas seriously. On the one hand, he knew the terms; on the other hand, the sarcasm had been awfully broad. "So tell me, Dad, what do you think?"

"About whether there are aliens? UFOs?"

"Uh-huh."

"Insufficient information." Another prolonged pause. "You?"

"I'm studying ufologists, Dad, not UFOs." Amid a diatribe about the study of objects the existence of whose subject matter had never been demonstrated, I took satisfaction at the success of my deflection. Had I been pinned down on the subject my own beliefs, I could not, for the life of me, guess what I would have at that moment said.

"'Discourse Analysis of a Self-Selecting Subculture,' scene one, take four," I emoted more than dictated into the microcassette recorder. No sociology paper would ever see dramatization, but any amusement I could extract from this experience was welcome. A mug of tepid coffee surrounded by cookie crumbs memorialized a previous bout of procrastination.

The title was as generic as I could make it. What passed for a plan remained workmanlike dullness—satisfy my obligation with a submission that, if it were ever published, would vanish without citation into a Bermuda Triangle of unquotable academic prose.

None of my rumination was new. I was stalling . . . again.

"The research presented in this paper draws inferences from the language usage of a unique Internet community." I tried unsuccessfully to feel some righteous indignation at the friends and colleagues who had egged me into this. "Internet chat-room visits are, as the netizen reader is surely aware, voluntary, as is each decision as to whether and about which topics to offer comment. Participation in this venue, it is furthermore necessary to recognize, can be entirely anonymous. Ianelli and Huang (1997) have documented the consequences of perceived anonymity, behavioral effects that are neither easily nor unambiguously disentangled from the group dynamic. The term 'dynamic'

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is, in this context, doubly pertinent, as both the membership and the interactions of chat-room occupants vary over time."

Was that sufficiently turgid, ill-formed, and wishy-washy to dissuade readership—or, better still, to preclude acceptance for publication? One could hope. One *did* hope.

Alone in my cluttered apartment, I, too, was—until the moment this paper was offered for publication—anonymous. What would be the interpretation of *my* words, *my* selection of metaphor, among my peer discourse analysts? Once this paper was sent off, my anonymity would be replaced by . . . what? Notoriety, I suspected.

But infamy had ceased to be my biggest concern. The political incorrectness of the phrase be damned, I was beginning to recognize that in the course of my research, I had gone native.

Kelly O'Brien had been at my party, but as the guest of a friend. Our usual conversation was an exchange of grunts when we occasionally crossed paths, most typically both of us on trash runs to our apartment complex's dumpster. Since the party, our relationship had been subtly different in a way I could not exactly define. My best guess was quiet amusement at my expense. Fair enough—I had been *very* drunk that night. Kelly was a grad student, too, but in her case, of computer science—another reason our chance encounters were brief.

After too many of my evenings spent researching the paper, her amusement became more overt. "How are the BEMs?" she asked, grinning, as we passed in the parking lot. She was dressed, as usual, in faded jeans, an oversized plaid flannel shirt, and an irksome aura of competence.

Bug-eyed monsters. Sighing, I began synopsizing my progress to date. She interrupted me mid-sentence. "My conscience is getting the best of me here."

"What do you mean?"

"You were set up, Brian, and I made it possible."

I tried again. "What do you mean?"

She brushed an errant wisp of hair from her eyes. "The proposal wasn't your idea. Your buddies," and she named a few, "goaded you into it. I'd pre-rigged the PC to intercept outgoing email."

"But the reply came from the journal."

Smugness and sympathy battled over her face. Smugness won. "It was from your friends. I spoofed the return address."

Her explanation of how she subverted the email system went over my head, which was in any event already spinning. Kelly wasn't the only one who had seemed unusually amused with me of late. "When was someone going to tell me?"

She shrugged. "Dunno. Everyone expected you to have a momentary panic attack when you saw the reply, then to realize the acceptance couldn't possibly be real. Your dogged seriousness as you keep doing this research has been the source of much entertainment."

I wasn't surprised. Some remote corner of my mind was, in fact, quite taken with their gag. Considering my frequent rants at their supposed provincialism, a maudlin fixation even sober about my milestone birthday, and my *saki*-swilling subterfuge with the *sushi*, their practical joke hardly lacked for poetic justice.

While a distant recess of my mind was processing that reaction, most of my consciousness was focused on an epiphany far more important: I intended to continue my new research.

The conversational gambit, "You got me good," released peals of laughter from friend after friend. By the third such incidence, I was grossly embarrassed at my gullibility. Rereading now my drunken proposal email and the only slightly less ridiculous acceptance mes-

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sage only made me feel worse. *How* had I been taken in for more than a week by such nonsense?

To be kind to myself, an absurdly strong work ethic had started me digging while still hung over—and, despite the absurd path that had led me to the UFO chat rooms, there actually were some interesting patterns there. An apparent cacophony of dialogue, I had been quick to determine, became more illuminating once I organized them by the participants' points of view. At one end of my self-made spectrum were the true believers, for whom no claim of alien manifestation or governmental cover-up was improbable. At the other extreme were the debunkers, for whom all evidence, no matter the claimed quality or quantity of corroborating fact, was as entirely *un*convincing. In between were the skeptics, who accepted nothing non-critically, but—while never, it would appear, actually convinced of the existence of UFOs or aliens—professed minds open to future evidence.

Kelly's parking-lot confession had broken some metaphorical ice, and we were on the way to becoming real friends instead of acquaintances by association, but our increasingly lengthy conversations kept reminding me of my naiveté. After she demonstrated how she'd messed with my email, and shared with me a few other hacking exploits, a horrifying thought occurred to me. Could I be certain the prank was over? I had no idea if my chat-room visits and Internet searches were being stage-managed, if friends with too much time on their hands were electronically still yanking my chain. No matter where I went on campus, might not someone with Kelly's mischievous skills detect the log-in to my university account and do . . . whatever?

The irony that I was becoming as paranoid as the true believers I might or might not be investigating did not escape me. I started frequenting municipal libraries, using Internet access from the public-library computers to revisit the chat rooms I'd previously explored. The good news was that my now-anonymous forays showed nothing at odds with my previous lurks.

My original survey had encompassed only a few days, but the longer I read, the more I perceived common patterns of discourse. I dug through the archives of several UFO chat rooms to increase my sample size. The common thread, I decided, was the influence of the skeptics. These people calmly but compellingly rebutted the many claims of close encounters, of alien abductions, of—arguing about parameter values for Drake's Equation—the mere plausibility of extraterrestrial visitors. Under the onslaught of the skeptics' quiet logic, the community in even the most rapidly growing chat room would soon peak. Since everyone participated via alias, I could not begin to tell whether the true believers were persuaded by these arguments, or merely moved to more hospitable environs.

I was as yet unconvinced, of course, that my new friend Kelly wasn't *somehow* still orchestrating the practical joke to end all practical jokes.

When my mother was a girl, Rule One was "No singing at the table." As best I can tell, there was no Rule Two. Neither Mom's musical interests nor aptitude were passed on—talent, alas, tends to be a recessive gene—but I certainly was exposed to plenty of music growing up. My tastes are a few centuries more current than my parents', but I'm enough like Mom to always be listening to something. Her musical preferences, however, lent themselves more to where I wanted to lead this conversation than did my own.

"You know," I began, "how some pieces of music are obviously related?" The somber, prematurely balding man across the table from me only nodded. "My musical gifts are limited, but I'm pretty good at recognizing compositions

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as being by the same composer. Whether I'm listening to a symphony, an opera, a sonata, or the requiem mass"—all Mom's taste, not mine, I hasten to add—"there's no mistaking Mozart."

My lunch companion poked unenthusiastically with a fork at his french fries. Nigel Wellman was an expatriate Brit teaching at a nearby liberal arts college. His field was lexical analysis, which was just barely close enough to discourse analysis that he had responded to my voice mail. I'd never heard of him until undertaking a literature search. We had met at a diner on the edge of his campus. "Had you mentioned wanting to discuss musicology, I would have steered you to someone else on the faculty."

I'd invited him to discuss overlap between our areas of research. That remained my plan. "Bear with me, Nigel." I rapped with little success on the bottom of a catsup bottle until our waiter went away. "Music was only an analogy. My speculation, which I hope you can validate, is that a person's textual writings also have similarities, despite a variety of topics and venues."

In a remarkably short time, half of his cheeseburger disappeared. "Of *course* such similarities exist. They underlie, for example, the many assertions that Shakespeare did not write the works popularly credited to him. While the most common alternate attribution is Sir Francis Bacon, there are other credible candidates." His voice warmed; his eyes shone. "Christopher Marlowe, for example, and Edward De Vere, the Earl of Oxford. The lexical metrics are quite fascinating."

"Metrics?" It was suddenly all I could do to get that word in edgewise.

"Indeed." My companion took a quick gulp of Coke, then launched into a lecture. That was okay—I was here to learn. "One can quantify language usage in a number of very precise ways. Average sentence length and variability of length. Average paragraph size, in both word and sentence count, and variability of same. Range of vocabulary and frequency with which synonyms are employed. Then there is sentence structure: preference for active or passive voice, degree of use of dependent clauses, rate of pronoun-for-noun substitutions." Flourishing his fork in grand emphasis, Nigel was entirely transformed from the gloomy fellow I'd met minutes earlier. "There are many other patterns: recourse to foreign expressions, application of various figures of speech, and so forth."

After a long while, the torrent of words slowed. I'd long since given up trying to follow the details, instead taking comfort in the one assessment I had been qualified to perform. Not only was Nigel widely published, but his papers were frequently cited in what appeared to be the mainstream publications of his esoteric field. Sensitized by the immersion in lexical analysis, I now couldn't help but notice my flowing-water metaphors.

"I *asked*," said Nigel irritably, "about your target."

"My what?"

Nothing remained in the Brit's glass but ice. He stirred the cubes with his straw. "Sudden interest in lexical analysis always means one thing: the desire to prove, or disprove, common authorship of some materials. So what axe are you grinding?"

"Pure academic research, I assure you."

Nigel arched an eyebrow skeptically.

After muttered practice for the whole drive over here, I was as prepared as I could be for this moment. In my study of Internet chat rooms, I explained, I'd sensed similarities in purportedly independent comments. "So," I wrapped up, "I've come to suspect there are people using multiple screen names. It's pretty sad to think anyone would try to bolster his arguments by hiding behind several personae. If I'm right, there would probably be a paper there—but not a paper

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for me. My field is sociology, not psychology . . . I have no intention of producing an article about a handful of UFO skeptics with too much time on their hands."

We haggled over the price for a quick scan of a few chat rooms, settling on a banana cream pie to go. I took the check, Nigel took a list of chat rooms and screen names from me, and we went our separate ways.

"My results," Nigel had insisted, "merit a steak dinner." He would say no more about those findings over the phone. The good news was I could buy our steaks at the grocery—he had a raft of hardcopies he wanted to show me, paperwork strewn across his apartment.

He shoved my bag unexamined straight into his refrigerator, extracting, while he was there, a beer. That cold bottle was for me; he took a warm one from the pantry for himself. Then he led the way to his study, where the decorating scheme was dead trees and pastel highlighter.

"What's up?"

Nigel waved me into the den's only chair. "You wondered if there were fewer skeptics than screen names." He fairly bounced on his toes.

"And were there?"

"Most definitely." My original list of aliases was pinned to a wall, a check mark beside every entry. He rapped it for emphasis. "A lot fewer."

As he walked me through a collection of printouts, replete with highlighting, underlinings, circled phrases, and marginal scribbles, I struggled to understand. "You're saying *one person* is inventing all these chat rooms-worth of dialogues? Why would someone do that?"

"That's *not* what I'm saying. The exchanges are quite real. In your terminology, there are many true believers, many debunkers." There was tapping and rustling as Nigel aligned his papers into a neat sheaf. "But of calm, dispassionately reasoning participants—those you call the skeptics—in several of these chat rooms, more than half of the relevant screen names map to a single person."

The statement was so astonishing that I set it aside for later analysis. "Anything else?"

"For one, your friend isn't a native English speaker." I must have started at the phrase *your friend*, because he clarified, "Your quarry. Fascinating." From a file cabinet emerged more papers, replete with other annotations. The more excited Nigel became, the more enigmatic grew his elucidations.

"Nigel? In words of one syllable or less?"

He took a deep breath. "My apologies. In a nutshell, the language usage is too formal—the always-correct grammar that is the classical sign of an educated non-native speaker. Most everyone else's dialogue is full of spelling errors that no plausible typo can explain, of slang and abbreviations. Our guy didn't use a single dangling participle or split infinitive. Surely you noticed how stilted that material reads." He accepted my nod and was off again. "This was so intriguing that I expanded the experiment a bit. Naturally, there are UFO-related chat rooms in many languages. I'm moderately fluent in French, German, and Japanese, and I found similar patterns there."

"Similar patterns." I was reduced to parroting, never a good sign.

"Chat rooms in each language in which the prevalent voice of reason disguises itself behind multiple screen names. One non-native speaker."

There was no denying the obvious question. "The same person across languages?"

Nigel canted his head thoughtfully. "English, French, and German, certainly. Japanese, I'm not qualified to say. But if I were a betting man, I'd say yes, there, too."

What is the motivation of someone who is fanatical about being calmly rea-

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soning? Before anyone began posing that riddle about *me*, I had other matters to attend to. If I expected renewal of my fellowship, I simply had to show progress on my dissertation.

My approved topic dealt with religious transformations in early medieval societies. More specifically, I was using discourse analysis in the context of long-ago royal conversions, assessing the impacts on the subject populaces. In those days, when the king converted, everyone else was expected to. I was looking for shifts in world view, how day-to-day routines and rituals were affected . . . those sorts of things.

My research involved mining contemporaneous literature for evidence. The work necessarily involved an indirect approach, of course, since only the writings of the elites were available. In the Middle Ages, who but the elites *could* write? I could go on and on, but the topic matters more here than the details.

State U. owned, curiously enough, thorough resources on the baptism of Clovis and the consequent mass conversion to Christianity of his people. I was poring over an English translation (Gregory, sixth-century Bishop of Tours, had, of course, written in Latin) of the *History of the Franks* when a dissertation-irrelevant question occurred to me. Were there chat rooms of a religious nature? I'd never looked.

A second set of Internet communities soon stunned me. Phenomena that in other venues I'd seen presented as proof of alien visitations or time travelers became, in this new context, signs of miracles or angels or visitations by the Virgin. Once again I encountered true believers, skeptics, and debunkers. These skeptics were as stubbornly persistent as any in the UFO realm. Some argued that unexpected manifestations were personal religious experiences, not to be analyzed. Others opined that these revelations were unavoidably suspect, associated as they were with fasting and sleepless vigils on solitary retreats.

With a flash of insight, I saw that the pattern was exactly the same as in the UFO scenarios: discrediting supposed strange events of any kind. I shivered as traditional content analysis confirmed what my gut already knew: *these* skeptics' themes of objectivity, isolation, and the uniqueness of mankind paralleled the UFO conversations.

I was entirely unsurprised when, soon after, Nigel Wellman completed a second lexical analysis. The same prolific skeptic frequented the religious chat rooms as the UFO chat rooms.

"Will you get that?" I yelled from my bedroom/office. Kelly was in the living room, and closer to the knock. I'd invited her over to split a pizza.

"Are you expecting anyone?"

"Just the pizza guy," I lied. I'd ordered on-line; the pizza wasn't due for another thirty minutes. My eyes were glued to four inset windows on the screen of my PC, two for the wireless webcams I'd hidden in my living room and two more for those in the hallway. Who knew I would ever get so involved with experimental methods? One of the webcams had a side view of Nigel Wellman waiting outside my front door, his cheeks and lips working in what I assumed was whistling. Another camera viewed the apartment door over his shoulder. Side and rear views of Kelly appeared in the final windows as she approached the door from its other side.

She swung the door open as Nigel's hand came up to knock again. My eyes stayed on the screen. Set-up had taken me a while, but I had clear shots of both of my guests' faces. I saw no surprise, no recognition. They did not know each other.

I couldn't tell whether I was relieved or disappointed.

"Nigel, Kelly." I ushered the two of them to my dining room table. "The pizza I promised *is* coming—only a bit later than I mentioned. Until then, I want to

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bring you both up to date." They took turns looking amazed as the full story of my recent chat-room obsessions unfolded. The pizza arrived as I was finishing.

"So *this* is your story? There's one person generating half or more of the analysis and argument in all of these chat rooms." Kelly tore at the pizza as she spoke, the slice she'd selected trailing long strings of molten cheese. "You want me to write software to find more signs of her."

"That's right. Will you?"

"Nice try." She deftly snapped stretchy cheese tendrils with a finger. "Some of us aren't that gullible."

"What do you mean?"

"I helped your friends get you. You're playing a return prank. No sale."

Nigel grimaced at his cold beer. I'd forgotten to let some warm up for him. "I've looked at several chat rooms on my own. Brian had nothing to do with my studies, or with which rooms, or even the languages I chose."

Kelly hoovered down the rest of her first slice before answering. "I was recruited in the practical joke on Brian. I don't question him having an accomplice."

It had never occurred to me Kelly would question *my* motives. I'd been reduced to buying webcams I couldn't afford to convince myself she wasn't *still* getting me. Then the benefit of my paranoid delusions struck me. "Come see what else I've been up to."

The amateur spy set-up, uncomfortably beyond-my-means confirmation of my own continuing suspicions, succeeded where my honest protestations had not. The webcams convinced Kelly that Nigel and I weren't co-conspirators in a counter-prank; she agreed to work with him on a program. Many lexical-analysis algorithms had long ago been committed to code; what I wanted Kelly to do was to take the standard tools Nigel used and embed them in a real-time search program. I needed to know—and by now my new friends were almost as curious—just how pervasive was our unseen skeptic.

Three days later, reconvened this time on Kelly's living room sofa, I watched in fascination as Nigel went over a collection of hardcopies strewn across a Salvation Army coffee table. These dialogues had been snagged by his/Kelly's science project. He circled phrases, highlighted text, muttered to himself. The conclusion: new chat rooms, new screen names, even new languages . . . and still more appearances of the same skeptic.

"That's not even the most interesting thing." A mouthful of popcorn muffled Kelly's words; she made a show of chewing faster as she deposited a fresh stratum of paper. "I altered the program a bit to search chat-room archives. Observe the dates."

The dates went back to 1995—soon after the birth of the commercial Internet. Who had the time and persistence?

Looking around, I couldn't help but remember the Island of Lost Toys from a perennial Christmas television special. There was every variety of cast-off PC, going back, if the tags could be believed, to 386 boxes. Several of the newer systems had been pressed into duty for tonight's happening. My mind's ear had rejected a more definitive label, like experiment. Whatever the evening's activity might prove to be, I didn't think it would turn out to be science.

Why was I so obsessed with this?

"Ready, guys?" Kelly was manic. She was clutching one of the many cell phones in her computer-filled apartment. The phones were bought-with-cash throwaways; I felt vaguely like a mob boss. The disposables seemed like prudent precautions until we had some idea what kind of obsessive-compulsive we were dealing with. (Someone like me, my inner self whispered.)

She nattered on about her preparations. My head overflowed with buzzwords, with little grasp of the telecomm

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set-up she'd masterminded. Six chat-room sessions had been established, accessed through a like number of aliases, Internet service providers, web hosting services, and untraceable cell-phone links. Our county is flat and sparsely populated, meaning cell-phone towers were few and are far between. Anyone hacking the mobile-phone system could gain only a very approximate idea of where we were. (In the state of lunacy, my inner voice volunteered.) The latest version of Nigel's and Kelly's lexical-analysis software monitored every chat session.

Kel inundated me with technotrivia about mechanisms supposedly further hiding us: network address translators, encrypted links, firewalls, dynamic host control protocol, spoofing. She could have imparted an equal amount of insight with much less effort by simply invoking BFM. That's black and that's magic; you can fill in the middle word.

It took a punch in the shoulder to rouse me from self-hypnosis. "What, Nigel?"

"Our wizard says we're ready, Brian."

I studied the area once more. Flashing icons on six monitors confirmed that the Skeptic—he had graduated to a proper noun—was active in every chat room, behind yet more pseudonyms. The Skeptic was, in fact, active in far more than six dialogues, but we'd limited our attentions to those electronic communities that could route private messages in addition to group chat.

The same sentence had been typed at each computer, awaiting only a mouse click to be dispatched. "Let's do it." We sat, each within easy reach of two computers. "On the count of three. One . . . two . . . three." We each clicked two mice.

"We know what you have been doing," challenged our six simultaneous messages.

The chimes of incoming responses rang out almost instantly. On my screens came, "I won't go back," and "Why are you back so soon?" One of Kelly's screens repeated, "I won't go back," while the other, cryptically, introduced, "How are wryteewr?" Nigel's displays offered, "Why are you back so soon?" and "Leave me alone."

"Too short to be conclusive," said Nigel. "No comment about that gibberish word."

We'd signaled together to get the Skeptic's attention. It had obviously worked; no reason to change tactics now. "Try, 'Why won't you come back?'" When the typing stopped, I added, "Go."

Multiple replies again, of which the most fascinating related to the rapid pace of breakdown of tribal barriers, the osmosis of cultural constructs via public exhibitions, and customs changing in reaction to the primitive but rapidly improving crafts of artisans. Nigel had risen from his seat; he crouched over me to poke at one of my keyboards.

"Let me think," I growled. "You're in my way."

The keyboard had a long, stretchy cord; he whisked away the console and began typing. Yet another window opened on one of my screens, blocking much of the oh-so-tantalizing text. "Good," said the Brit. "Finally a sample long enough for analysis. It's definitely from our friend."

Breakdown of tribal barriers? Was our mysterious Skeptic an anthropologist? If so, why spend so much time discussing UFOs? Breakdown of tribal barriers? My mind suggested some possible translations: globalization, democratization, and the spread of capitalism. Options for the other unexpected phrases followed: ubiquitous American music and movies; a world in technological ferment.

Not an anthropologist. A sociologist.

Another of Dad's household rules had me shaking my head for much of my youth. Rule Three opined that things are often what they seem. For a long time, I thought it only a too-cute reversal of the

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old adage about things *not* always being what they seem. My first college class in philosophy opened my metaphorical eyes: Rule Three was a whole lot easier to offer to a kid than the principle of Occam's razor. William of Occam, a fourteenth century British philosopher, had famously declared that entities should not be unnecessarily multiplied. Famously, but not very lucidly. Occam's Razor was commonly translated into: take the simplest explanation unless there is evidence of a more complex reason. Rule Three—once I got it, I had to approve.

Without allowing myself a chance for second thoughts, I typed and sent, "So for how long has your kind been studying Earth?"

"You were only half right," wrote the being who had quickly adopted the Skeptic as a descriptor. That was the first reaction in some time to my continuing exposition.

"I was ENTIRELY right," I typed in retort. "That is not to dispute a second fact of which I was then unaware."

"You are more like your father, I think, than you realize."

I glowered at the monitor in more than mild indignation—then laughed. "It's true," I keyed. What purpose was there in denial? The Skeptic was, by design, a master observer.

More precisely, it was an extraterrestrial artificial intelligence inserted, mobile, into 1995's then-nascent Internet. An alien mind left to secretly study humanity and to report its findings, should its just-passing-through patron species ever come back.

Given interstellar distances, a return visit in fewer than several decades was not to be expected . . . hence, I now understood, the Skeptic's panicked reaction to an apparent return in a few scant years. It could have meant an in-transit emergency. The wryteewr were, simply, AI crewmates about which the Skeptic worried. The Internet offered no mechanism for conveying non-human languages; without a concise translation, the AI had resorted to transliteration.

"We know what you have been doing," I had challenged. In context, which we did *not* have at the time, those words could have been, and were, mistaken to mean, "We know you have gone native. That's why we're back. That's why we're communicating over the humans' primitive network in which you have tried unsuccessfully to hide."

That the alien AI who had blurted, "I won't go back," *had* gone native, I did not doubt. Our ethereal visitor found humanity endlessly fascinating, a cauldron of cultures only beginning to blend into a planetary unity. Its creators had completed that homogenizing transition centuries earlier. Earth was simply too fascinating a place to leave.

And the superhuman display of multitasking skepticism that had unwittingly revealed the surreptitious sociologist? The AI's persistent, dogged discrediting of all things paranormal was, ironically, intended to discourage humans from looking for ETs, real or virtual.

But I hadn't quite yet answered the Skeptic's question. Dad would have done so in eight words or less. With me, as with Mom, a significant reply was more about the journey than the destination. I resumed my tale.

"What now?" Kelly's question had had a succinctness of which Dad would have been proud.

"Are we off-line?" My head was pounding, this time without benefit of alcohol.

She gestured at our collection of cell phones all gathered in a row. Their tiny LCD screens were blank. The monitors, too, were dark; the status LEDs on the system boxes were unlit.

"What now, indeed," agreed Nigel. "What would the authorities make of our extracurricular project?" He laughed nervously. "That assumes one knew which authorities were appropriate. I

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haven't a clue."

It could have been my imagination, but I hadn't thought so. "Are you both looking at me? Expecting *me* to decide?"

"Uh-huh."

"Yes."

Holy hell. *Why me?* "If you don't mind me asking, do *you* believe we've 'spoken' with an alien AI sociologist freely roaming the Internet?" Two pensive nods. "I suppose you think this is, somehow, a sociological matter." Two *more* nods, this time emphatic.

The credible announcement of extraterrestrial intelligence could—would—impact society seismically. Credible, yes, but not 100 percent incontrovertible: the "proof" of any claim depended on how and when—and even whether, now that the shock of its unmasking was past—the AI we'd named the Skeptic responded to future contacts. Would any claims we three might make become the next story our alien strove, in its quietly compelling way, to undermine?

My eyes squeezed shut in thought, and in remembrance of coursework past. The Copernican revolution that the Earth was not the center of the Universe took centuries to reach general—and still incomplete—acceptance. Darwin's theory of evolution remained controversial in countless communities. The medieval conversions that until recently had been the myopic focus of my interests . . . yes, I knew all about how disruptive a shift in world view could be. *We are not alone* was as major a world-view change as I could conceive of.

"Brian." Kelly's voice was soft but insistent. "We can't go blithely about our business with *this* hanging over our heads. It's far more your specialty than either of ours to understand the consequences."

On what basis could *I* presume to make such a decision?

"Let me sleep on it," I'd lied.

* * *

"I was no sooner home from Kelly's unit than I went back on-line," I typed. If the decision was to be mine alone, there was no reason not to continue the discussion one-on-one. I'd necessarily reconnected with none of the BFM subterfuge Kelly could arrange. Any danger I could foresee in renewed contact was not to me. "Of course, you know that."

"Will you reveal me?" the Skeptic had asked as soon as I'd dialed up, privately, from my own apartment and associated myself with the recent confrontation. I had as quickly responded, albeit with uncharacteristic brevity, "I don't know." After what seemed endless introspection, although I knew it was only seconds, I had changed my answer to an even terser, "Yes."

I had, for two hours now, been handling the follow-up question, "Why?"

This had begun with my failure to observe Rule Two: think *before* you do things. I'd unmasked the Skeptic by belatedly applying Rule Three: things are often what they seem.

Why was I so fixated on Dad's damned rules?

My rambling answer had, finally, come to the very heart of the matter. "I was trained to observe societies, not to shatter them," I typed. It was a calm, professional position to take. It was entirely true.

But did that narrow truth matter? I couldn't—I didn't—believe things were that simple.

Copernicus had been right, no matter the shock to people's egos. Earth *wasn't* the center of the Universe, and it couldn't be wrong that we now recognized that. Darwin, too—humanity was part of the tapestry of life, not somehow above or apart from it. I couldn't imagine that, if I somehow had the power to reverse those intellectual awakenings, I would. So who was I to suppress, presuming for the moment that I even could, a discovery as fundamental as those of Copernicus and Darwin? Fact, Brian: we *aren't* alone.

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I was convinced . . . I just wish I knew why.

Unexpected motion caught my eye. The PC monitor now showed an oddly familiar little boy bouncing on a bed. As if triggered by my renewed attention, a short string of text appeared across the bottom of the screen. "I understand."

I stared into the one webcam I hadn't returned, now perched atop the monitor. With the realization that the Skeptic was watching me, the familiarity of the youngster was obvious. He was the backwards extrapolation from my real-time image to how I might have looked as a five-year-old. Had the Skeptic known to apply a buzz cut, it would have had me right.

"I understand," I read aloud. *What* did the Skeptic understand?, I wondered, as the virtual bed shuddered in synchronicity with "my" jumping. Behind "me," books and toys toppled from cluttered shelves. That being a sociologist was not a license to censor? That was *a* truth, I was certain, but was it the whole truth?

The infuriating admonition from my youth echoed in my mind's ear a split second before "Rule One" popped tersely onto the screen. *If it shakes the house, don't do it.*

My alien friend did understand me. He knew me, in fact, far better than did my own father—or than I knew myself.

I never was any good at following the rules. ■

With thanks (and apologies) to Jenn.

The author's web site is:
www.sfwa.org/members/lerner/

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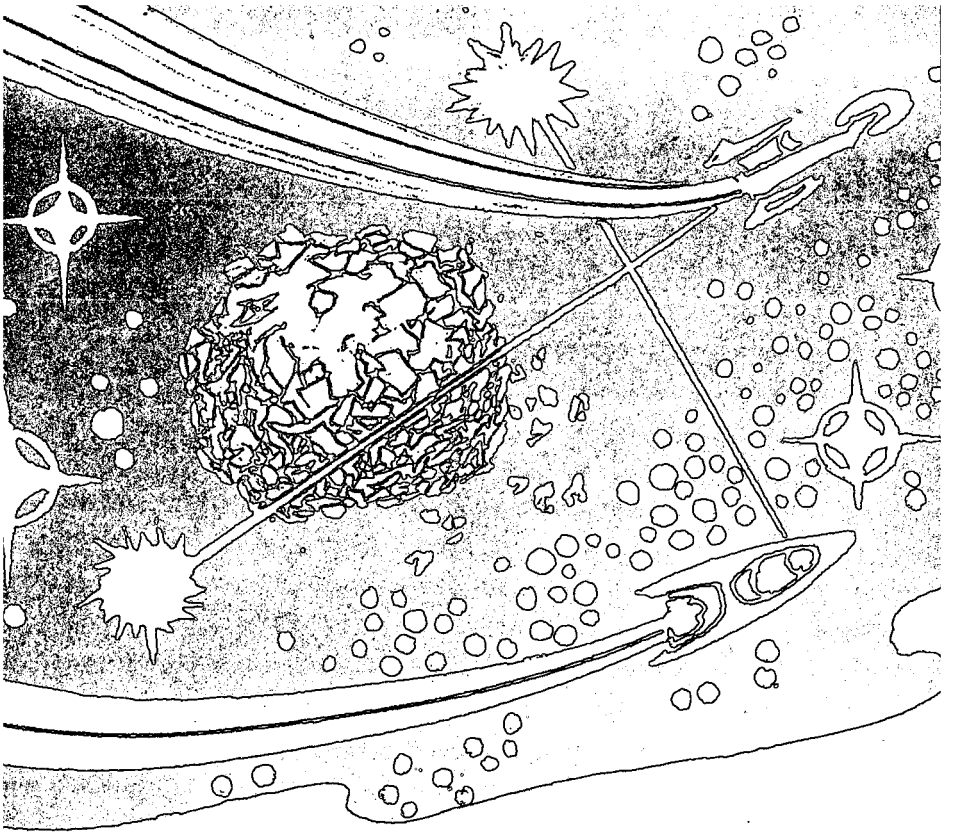

SAM AND THE FLYING DUTCHMAN

Ben Bova

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Illustration by Kelly Freas

There are some forces

that even the irrepressible

Sam Gunn

finds hard to elude. . . .

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I ushered her into Sam's office and helped her out of the bulky dark coat she was wearing. Once she let the hood fall back, I damned near dropped the coat. I recognized her. Who could forget her? She was exquisite, so stunningly beautiful that even the irrepressible Sam Gunn was struck speechless. More beautiful than any woman I had ever seen.

But haunted.

It was more than her big, soulful eyes. More than the almost frightened way she had of glancing all around as she entered Sam's office, as if expecting someone to leap out of hiding at her. She looked *tragic*. Lovely and doomed and tragic.

"Mr. Gunn, I need your help," she said to Sam. Those were the first words she spoke, even before she took the chair that I was holding for her. Her voice was like the sigh of a breeze in a midnight forest.

Sam was standing behind his desk, on the little hidden platform back there that makes him look taller than his real 165 centimeters. As I said, even Sam was speechless. Leather-tongued, clatter-mouthed Sam Gunn simply stood and stared at her in stupefied awe.

Then he found his voice. "Anything," he said, in a choked whisper. "I'd do anything for you."

Despite the fact that Sam was getting married in just three weeks' time, it was obvious that he'd tumbled head over heels for Amanda Cunningham the minute he saw her. Instantly. Sam Gunn was always falling in love, even more often than he made fortunes of money and lost them again. But this time it looked as if he'd really been struck by the thunderbolt.

If she weren't so beautiful, so troubled, seeing the two of them together would have been almost ludicrous. Amanda Cunningham looked like a Greek goddess, except that her shoulder-length hair was radiant golden blonde. She wore a modest knee-length sheath of delicate pink that couldn't hide the curves of her ample body. And those eyes! They were bright china blue, but deep, terribly troubled, unbearably sad.

And there was Sam: stubby as a worn old pencil, with a bristle of red hair and his gap-toothed mouth hanging open. Sam had the kind of electricity in him that made it almost impossible for him to stand still for more than thirty seconds at a time. Yet he stood gaping at Amanda Cunningham, as tongue-tied as a teenager on his first date.

And me. Compared to Sam, I'm a rugged outdoorsy type of guy. Of course, I wear lifts in my boots and a tummy tingler that helps keep my gut flat. Women have told me that my face is kind of cute in a cherubic sort of way, and I believe them—until I look in the mirror and see the pouchy eyes and the trim black beard that covers my receding chin. What did it matter? Amanda Cunningham didn't even glance at me; her attention was focused completely on Sam.

It was really comical. Yet I wasn't laughing.

Sam just stared at her, transfixed. Bewitched. I was still holding one of the leather-covered chairs for her. She sat down without looking at it, as if she were accustomed to there being a chair wherever she chose to sit.

"You must understand, Mr. Gunn," she said softly. "What I ask is very dangerous . . ."

Still standing in front of his high-backed swivel chair, his eyes never leaving hers, Sam waved one hand as if to scoff at the thought of danger.

"It involves flying out to the Belt," she continued.

"Anywhere," Sam said. "For you."

"To find my husband."

That broke the spell. Definitely.

Sam's company was S. Gunn Enterprises, Unlimited. He was involved in a lot of different operations, including hauling freight between the Earth and Moon, and transporting equipment out to the Asteroid Belt. He was also dickering to build a gambling casino and hotel

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on the Moon, but that's another story.

"To find your husband?" Sam asked her, his face sagging with disappointment.

"My ex-husband," said Amanda Cunningham. "We were divorced several years ago."

"Oh." Sam brightened.

"My current husband is Martin Humphries," she went on, her voice sinking lower.

"Oh," Sam repeated, plopping down into his chair like a man shot in the heart. "Amanda Cunningham Humphries."

"Yes," she said.

"*The* Martin Humphries?"

"Yes," she repeated, almost whispering it.

Mrs. Martin Humphries. I'd seen pictures of her, of course, and vids on the society nets. I'd even glimpsed her in person once, across a ballroom crowded with the very wealthiest of the wealthy. Even in the midst of all that glitter and opulence she had glowed like a beautiful princess in a cave full of trolls. Martin Humphries was towing her around the party like an Olympic trophy. I popped my monocle and almost forgot the phony German accent I'd been using all evening. That was a couple of years ago, when I'd been working the society circuit selling shares of nonexistent tritium mines. On Mars, yet. The richer they are, the easier they bite.

Martin Humphries was probably the richest person in the solar system, founder and chief of Humphries Space Systems, and well-known to be a prime S.O.B. I'd never try to scam him. If he bit on my bait, it could be fatal. So that's why she looks so miserable, I thought. Married to him. I felt sorry for Amanda Cunningham Humphries.

But sorry or not, this could be the break I'd been waiting for. Amanda Cunningham Humphries was the wife of the richest sumbitch in the solar system. She could buy anything she wanted, including Sam's whole ramshackle company, which was teetering on the brink of bankruptcy. As usual. Yet she was asking Sam for help, like a lady in distress. She was scared.

"Martin Humphries," Sam repeated.

She nodded wordlessly. She certainly did not look happy about being married to Martin Humphries.

Sam swallowed visibly, his Adam's apple bobbing up and down twice. Then he got his feet again and said, as brightly as he could manage, "Why don't we discuss this over lunch?"

Sam's office in those days was on the L-5 habitat *Beethoven*. Funny name for a space structure that housed some fifty thousand people, I know. It was built by a consortium of American, European, Russian and Japanese corporations. The only name they could agree on was Beethoven's, thanks to the fact that the head of Yamagata Corp. had always wanted to be a symphony orchestra conductor.

To his credit, Sam's office was not grand or imposing. He said he didn't want to waste his money on furniture or real estate. Not that he had any money to waste, at the time. The suite was compact, tastefully decorated, with wall screens that showed idyllic scenes of woods and waterfalls. Sam had a sort of picture gallery on the wall behind his desk: S. Gunn with the great and powerful figures of the day—most of whom were out to sue him, if not have him murdered—plus several photos of Sam with various beauties in revealing attire.

I, as his "special consultant and advisor," sat off to one side of his teak and chrome desk, where I could swivel from Sam to his visitor and back again.

Amanda Humphries shook her lovely head. "I can't go out to lunch with you, Mr. Gunn. I shouldn't be seen in public with you."

Before Sam could react to that, she added, "It's nothing personal. It's just . . . I don't want my husband to know that I've turned to you."

Undeterred, Sam put on a lopsided grin and said, "Well, we could have lunch sent in here." He turned to me. "Gar, why don't you rustle us up some grub?"

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I made a smile at his sudden Western folksiness. Sam was a con man, and everybody knew it. That made it all the easier for me to con him. I'm a scam artist, myself, *par excellence,* and it ain't bragging if you can do it. Still, I'd been very roundabout in approaching Sam. Conning a con man takes some finesse, let me tell you.

About a year ago, I talked myself into a job with the Honorable Jill Myers, former U.S. Senator and American representative on the International Court of Justice. Judge Myers was an old, old friend of Sam's, dating back to the early days when they'd both been astronauts working for the old NASA.

I had passed myself off to Myers' people as Garret G. Garrison III, the penniless son of one of the oldest families in Texas. I had doctored up a biography and a dozen or so phony news media reports. With just a bit of money in the right hands, when Myers' people checked me out in the various web nets, there was enough in place to convince them that I was poor but bright, talented and honest.

Three out of four ain't bad. I was certainly poor, bright and talented.

Jill Myers wanted to marry Sam. Why, I'll never figure out. Sam was—is!—a philandering, womanizing, skirt-chasing bundle of testosterone who falls in love the way Pavlov's dogs salivated when they heard a bell ring. But Jill Myers wanted to marry the little scoundrel, and Sam had even proposed to her—once he ran out of all the other sources of funding that he could think of. Did I mention that Judge Myers comes from Old Money? She does: the kind of New England family that still has the first nickel they made in the molasses-for-rum-for-slaves trade back in precolonial days.

Anyway, I had sweet-talked my way into Judge Myers' confidence (and worked damned hard for her, too, I might add). So when they set a date for the wedding, she asked me to join Sam's staff and keep an eye on him. She didn't want him to disappear and leave her standing at the altar.

Sam took me in without a qualm, gave me the title of "special consultant and advisor to the CEO," and put me in the office next to his. He knew I was Justice Myers' enforcer, but it didn't seem to bother him a bit.

Sam and I got along beautifully; like kindred souls, really. Once I told him the long, sad (and totally false) story of my life, he took to me like a big brother.

"Gar," he told me more than once, "we're two of a kind. Always trying to get out from under the big guys."

I agreed fervently.

I've been a grifter all my life, ever since I sweet-talked Sister Agonista into overlooking the fact that she caught me cheating on the year-end exams in sixth grade. It was a neat scam for an eleven-year-old: I let her catch me, I let her think she had scared me onto the path of righteousness, and she was so happy about it that she never tumbled to the fact that I had sold answer sheets to half the kids in the school.

Anyway, life was always kind of rough-and-tumble for me. You hit it big here, and the next time you barely get out with the hide on your back. I had been at it long enough so that by now I was slowing down, getting a little tired, looking for the one big score that would let me wrap it all up and live the rest of my life in ill-gotten ease. I knew Sam Gunn was the con man's con man: the little rogue had made more fortunes than the New York Stock Exchange—and lost them just as quickly as he could go chasing after some new rainbow. I figured that if I cozied up real close to Sam, I could snatch his next pot of gold before he had a chance to piss it away.

So when Judge Myers asked me to keep an eye on Sam, I went out to the *Beethoven* habitat that same day, alert and ready for my big chance to nail my last and best score.

Amanda Cunningham Humphries might just be that opportunity, I realized.

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So now I was bringing a tray of lunch in for Sam and Mrs. Humphries, setting it all out on Sam's desk while they chatted, and then retreating to my own little office so they could talk in privacy.

Privacy, hah! I slipped the acoustic amplifier out of my desk drawer and stuck it on the wall that my office shared with Sam's. Once I had wormed the earplug in, I could hear everything they said.

Which wasn't all that much. Mrs. Humphries was very guarded about it all.

"I have a coded video chip that I want you to deliver to my ex-husband," she told Sam.

"Okay," he said, "but you could have a courier service make the delivery, even out to the Belt. I don't see why—"

"My ex-husband is Lars Fuchs."

Bingo! I don't know how Sam reacted to that news, but I nearly jumped out of my chair to turn a somersault. Her first husband was Lars Fuchs! Fuchs the pirate. Fuchs the renegade. Fuchs and Humphries had fought a minor war out there in the Belt a few years earlier. It had ended when Humphries' mercenaries had finally captured Fuchs and the people of Ceres had exiled him for life.

For years now, Fuchs had wandered through the Belt, an exile eking out a living as a miner, a rock rat. Making a legend of himself. The Flying Dutchman of the Asteroid Belt.

It must have been right after he was exiled, I guessed, that Amanda Cunningham had divorced Fuchs and married his bitter rival, Humphries. I later found out that I was right. That's exactly what had happened. But with a twist. She divorced Fuchs and married Humphries on the condition that Humphries would stop trying to track Fuchs down and have him killed. Exile was punishment enough, she convinced Humphries. But the price for that tender mercy was her body. From the haunted look of her, maybe the price included her soul.

Now she wanted to send a message to her ex. Why? What was in the message? Humphries would pay a small fortune to find out. No, I decided; he'd pay a *large* fortune. To me.

Mrs. Humphries didn't have all that much more to say and she left the office immediately after they finished their lunch, bundled once more into that shapeless black coat with its hood pulled up to hide her face.

I bounced back into Sam's office. He was sitting back in his chair, the expression on his face somewhere between exalted and terrified.

"She needs my help," Sam murmured, as if talking in his sleep.

"Our help," I corrected.

Sam blinked, shook himself, and sat erect. He nodded and grinned at me. "I knew I could count on you, Gar."

Then I remembered that I was supposed to be working for Judge Myers.

"He's going out to the Belt?" Judge Myers' chestnut-brown eyes glared at me. "And you're letting him do it?"

Some people called Jill Myers plain or even unattractive (behind her back, of course), but I always thought of her as kind of cute. In a way, she looked almost like Sam's sister might: her face was round as a pie, with a stubby little nose and a sprinkling of freckles. Her hair was light brown and straight as can be; she kept it in a short, no-nonsense bob and refused to let stylists fancy it up for her.

Her image in my desk screen clearly showed, though, that she was angry. Not at Sam. At me.

"Garrison, I sent you to keep that little so-and-so on track for our wedding, and now you're going out to the Belt with him?"

"It'll only be for a few days," I said. Truthfully, that's all I expected at that point.

Her anger abated a skosh; suspicion replaced it.

"What's this all about, Gar?"

If I told her that Sam had gone bonkers over Amanda Humphries, she'd be up at *Beethoven* on the next shuttle,

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so I temporized a little.

"He's looking into a new business opportunity at Ceres. It should only take a few days."

Fusion torch ships could zip out to the Belt at a constant acceleration. They cost an arm and two legs, but Sam was in his "spare no expenses" mode, and I agreed with him. We could zip out to the Belt in four days, deliver the message, and be home again in time for the wedding. We'd even have a day or so to spare, I thought.

One thing about Judge Myers: she couldn't stay angry for more than a few minutes at a time. But from the expression on her face, she remained highly suspicious.

"I want a call from you every day, Gar," she said. "I know you can't keep Sam on a leash; nobody can. But I want to know where you are and what you're doing."

"Yes, ma'am. Of course."

"Every day."

"Right."

Easier said than done.

Sam rented a torch ship, the smallest he could find—just a set of fusion engines and propellant tanks with a crew pod attached. It was called *Achernar,* and its accommodations were really Spartan. Sam piloted it himself.

"That's why I keep my astronaut's qualifications up to date with the chickenshit IAA," he told me, with a mischievous wink. "No sense spending money on a pilot when I can fly these birds myself."

For four days, we raced out to Ceres, accelerating at a half gee most of the time, then decelerating at a gee-and-a-half. Sam wanted to go even faster, but the IAA wouldn't approve his original plan, and he had no choice. If he didn't follow their flight plan, the IAA controllers at Ceres would impound *Achernar* and send us back to Earth for a disciplinary hearing.

So Sam stuck to their rules, fussing and fidgeting every centimeter of the way. He hated bureaucracies and bureaucrats. He especially loathed being forced to do things their way instead of his own.

The trip out was less than luxurious, let me tell you. But the deceleration was absolute agony for me; I felt as if I weighed about a ton and I was scared even to try to stand up.

Sam took the strain cheerfully. "Double strength jockstrap, Gar," he told me, grinning. "That's the secret of my success."

I stayed seated as much as possible. I even slept in the copilot's reclinable chair, wishing that the ship had been primitive enough to include a relief tube among its equipment fixtures.

People who don't know any better think that the rock rats out in the Belt are a bunch of rough-and-tumble, crusty, hard-fisted prospectors and miners. Well, sure, there are some like that, but most of the rock rats are university-educated engineers and technicians. After all, they work with spacecraft and teleoperated machinery out at the frontier of human civilization. They're out there in the dark, cold, mostly empty Asteroid Belt, on their own, the nearest help usually so far away that it's useless to them. They don't use mules and shovels, and they don't have barroom brawls or shootouts.

Most nights, that is.

Sam's first stop after we docked at the habitat *Chrysalis* was the bar.

The *Chrysalis* habitat, by the way, was something like a circular, rotating junkyard. The rock rats had built it over the years by putting used or abandoned spacecraft together, hooking them up like a Tinkertoy merry-go-round and spinning the whole contraption to produce an artificial gravity inside. It was better than living in Ceres itself, with its minuscule gravity and the constant haze of dust that you stirred up with every move you made. The earliest rock rats actually did live inside Ceres. That's why they built the ramshackle *Chrysalis* as quickly as they could.

I worried about hard radiation, but Sam

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told me the habitat had a superconducting shield, the same as spacecraft use.

"You're as safe as you'd be on Earth," Sam assured me. "Just about."

It was the *just about* that scared me.

"Why are we going to the bar?" I asked, striding along beside him down the habitat's central corridor. Well, maybe "central corridor" is an overstatement. We were walking down the main passageway of one of the spacecraft that made up *Chrysalis*. Up ahead was a hatch that connected to the next spacecraft component, and so on. We could walk a complete circle and come back to the airlock where *Achernar* was docked, if we'd wanted to.

"Gonna meet the mayor," said Sam.

The mayor?

Well, anyway, we go straight to the bar. I had expected a kind of rough place, maybe like a biker joint. Instead the place looked like a sophisticated cocktail lounge.

It was called the Crystal Palace, and it was as quiet and subdued as one of those high-class watering holes in Old Manhattan. Soft lighting, plush faux-leather wall coverings, muted Mozart coming through the speakers set in the overhead. It was mid-afternoon and there were only about a dozen people in the place; a few at the bar, the rest in high-backed booths that gave them plenty of privacy.

Sam sauntered up to the bar and perched on one of the swiveling stools. He spun around a few times, taking in the local scenery. The only woman in the place was the human bartender, and she wasn't much better looking than the robots that trundled drinks out to the guys in the booths.

"What's fer yew?" she asked. She looked like she was into weight-lifting. The gray sweatshirt she was wearing had the sleeves cut off; plenty of muscle in her arms. The expression on her squarish face was no-nonsense, unsmiling.

"West Tennessee," said Sam. "Right?"

The bartender looked surprised. "Huntsville, 'Bama."

"Heart of the Tennessee Valley," Sam said. "I come from the blue grass country, myself."

Which was a complete lie. Sam was born in either Nevada or Pennsylvania, depending on which of his dossiers you read. Or maybe Luzon, in the Philippines.

Well, in less than six minutes Sam's got the bartender laughing and trading redneck jokes with him. Her name was Belinda. I just sat beside him and watched the master at work. He could charm the devil out of hell, Sam could.

Sam ordered Tennessee corn mash for both of us. While he chatted up the bartender, though, I noticed that the place was emptying out. The three guys at the bar got up and left first, one by one. Then, out of the corner of my eye, I saw the guys in the booths heading for the door. No big rush, but within a few minutes they had all walked out. On tiptoes.

I said nothing, but soon enough Sam realized we were alone.

"What happened?" he asked Belinda. "We chased everybody out?"

She shook her head. "Rock rats worry about strangers. They prob'ly think you're maybe a tax assessor or a safety inspector from the IAA."

Sam laughed. "Me? From the IAA? Hell, no. I'm Sam Gunn. Maybe you've heard of me?"

"No! Sam Gunn? You couldn't be!"

"That's me," Sam said, with his Huckleberry Finn grin.

"You were the first guy out here in the Belt," said Belinda, real admiration glowing in her eyes.

"Yep. Captured a nickel/iron asteroid and towed her back to Earth orbit."

"Pittsburgh. I heard about it. Took you a couple of years, didn't it?"

Sam nodded. He was enjoying the adulation.

"That was a long time ago," Belinda said. "I thought you'd be a lot older."

"I am."

She laughed, a hearty roar that made the glasses on the back bar rattle. "Re-

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juve therapy, right?"

"Why not?"

Just then a red-haired mountain strode into the bar. He was one of the biggest men I've ever seen. He didn't look fat, either: just *big*, with a shaggy mane of brick-red hair and a shaggier beard to match.

He walked right up to us.

"You're Sam Gunn." It wasn't a question.

"Right," said Sam. Swiveling toward me, he added, "And this young fellow here is Garret G. Garrison III."

"The third, huh?" the redhead huffed at me. "What happened to the first two?"

"Hung for stealin' horses," I lied, putting on my thickest Wild West accent.

Belinda laughed at that. The redhead simply huffed.

"You're George Ambrose, right?" Sam asked.

"Big George, that's me."

"The mayor of this fair community," Sam added.

"They elected me th' fookin' chief," Big George said, almost belligerently. "Now, whattaya want to see me about?"

"About Lars Fuchs."

George's eyes went cold and narrow. Belinda backed away from us and went down the bar, suddenly busy with the glassware.

"What about Lars Fuchs?" George asked.

"I want to meet him. I've got a business proposition for him."

George folded his beefy arms across his massive chest. "Fuchs is an exile. Hasn't been anywhere near Ceres for dog's years. Hell, this fookin' habitat wasn't even finished when we tossed him out. We were still livin' down inside th' rock."

Sam rested his elbows on the bar and smiled disarmingly at Big George. "Well, I've got a business proposition for Fuchs and I need to talk to him."

"What kind of a business proposition?"

With a perfectly straight face, Sam answered, "I'm thinking of starting a tourist service here in the Belt. You know: visit Ceres, see a mining operation at work on one of the asteroids, go out in a suit and chip some gold or diamonds to bring back home. That kind of thing."

George said nothing, but I could see the wheels turning behind that wild red mane of his.

"It could mean an influx of money for your people," Sam went on, in his best snake-oil spiel. "A hotel here in orbit around Ceres, rich tourists flooding in. Lots of money."

George unbent his arms, but he still remained standing. "What's all this got to do with Fuchs?"

"Shiploads full of rich tourists might make a tempting target for a pirate."

"Bullshit."

"You don't think he'd attack tour ships?"

"Lars wouldn't do that. He's not a fookin' pirate. Not in that sense, anyway."

"I'd rather hear that from him," Sam said. "In fact, I've got to have his personal assurance before my backers will invest in the scheme."

George stared at Sam for a long moment, deep suspicion written clearly on his face. "Nobody knows where Lars is," he said at last. "You might as well go back home. Nobody here's gonna give you any help."

We left the bar with Big George glowering at our backs so hard I could feel the heat. Following the maps on the wall screens in the passageways, we found the adjoining rooms that I had booked for us.

"Now what?" I asked Sam as I unpacked my travel bag.

"Now we wait."

Sam had simply tossed his bag on the bed of his room and barged through the connecting door into mine. We had packed for only a three-day stay at Ceres, although we had more gear stowed in *Achernar*. Something had to happen pretty quick, I thought.

"Wait for what?" I asked.

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"Developments."

I put my carefully-folded clothes in a drawer, hung my extra pair of wrinkle-proof slacks in the closet, and set up my toiletries in the lavatory. Sam made himself comfortable in the room's only chair, a recliner designed to look like an astronaut's couch. He cranked it down so far I thought he was going to take a nap.

Sitting on the bed, I told him, "Sam, I've got to call Judge Myers."

"Go right ahead," he said.

"What should I tell her?"

"Tell her we'll be back in time for the wedding."

I doubted that.

Two days passed without a word from anyone. Sam even tried to date Belinda, he was getting so desperate, but she wouldn't have anything to do with him.

"They all know Fuchs," Sam said to me. "They like him and they're protecting him."

It was common knowledge that Humphries had sworn to kill Fuchs, but Amanda had married Humphries on the condition that he left Fuchs alone. Everybody in Ceres—from Belinda the barmaid to the last rock rat—thought that we were working for Humphries, trying to find Fuchs and murder him. Or at least locate him, so one of Humphries' hired killers could knock him off. Fuchs was out there in the Belt somewhere, cruising through that dark emptiness like some Flying Dutchman, alone, taking a strangely measured kind of vengeance on unmanned Humphries ships.

I had other fish to fry, though. I wanted to find out what was on the chip that Amanda had given Sam, her message to her ex-husband. What did she want to tell him? Fuchs was a thorn in Humphries' side; maybe only a small thorn, but he drew blood, nonetheless. Humphries would pay a fortune for that message, and I intended to sell it to him.

But I had to get it away from Sam first.

Judge Myers was not happy with my equivocating reports to her. Definitely not happy.

There's no way to have a conversation in real time between Ceres and Earth; the distance makes it impossible. It takes nearly half an hour for a message to cross one-way, even when the two bodies are at their closest. So I sent reports to Judge Myers and—usually within an hour—I'd get a response from her.

After my first report, she had a wry grin on her face when she called back. "Garrison, I know it's about as easy to keep Sam in line as nailing tapioca to a wall in zero-gee, but all the plans for the wedding are set. It's going to be the biggest social event of the year. You've got to make sure that he's here. I'm depending on you, Garrison."

A day later, her smile had disappeared. "The wedding's only a week from now, Garrison," she said after my second call to her. "I want that little scoundrel at the altar!"

Third call, the next day: "I don't care what he's doing! Get him back here! Now!"

That's when Sam came up with his bright idea.

"Pack up your duds, Gar," he announced brightly. "We're going to take a little spin around the Belt."

I was too surprised to ask questions. In less than an hour, we were back in *Achernar* and heading out from Ceres. Sam had already filed a flight plan with the IAA controllers. As far as they were concerned, Sam was going to visit three specific asteroids, which might be used as tourist stops if and when he started his operation in the Belt. Of course, I knew that once we cleared Ceres, there was no one and nothing that could hold him to that plan.

"What are we doing?" I asked, sitting in the right-hand seat of the cockpit. "Where are we going?"

"To meet Fuchs," said Sam.

"You've made contact with him?"

"Nope," Sam replied, grinning as if he knew something nobody else knew.

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"But I'm willing to bet *somebody* has. Maybe Big George. Fuchs saved his life once, did you know that?"

"But how—"

"It's simple," Sam answered before I could finish the question. "We let it be known that we want to see Fuchs. Everybody says they don't know where he is. We go out into the Belt, away from everything, including snoops who might rat out Fuchs to Martin Humphries. Somebody from *Chrysalis* calls Fuchs and tells him about us. Fuchs intercepts our ship to see what I want. I give him Amanda's message chip. Q.E.D."

It made a certain amount of sense. But I had my doubts.

"What if Fuchs just blasts us?"

"Not his style. He's only attacked unmanned ships."

"He wiped out a HSS base on Vesta, didn't he? Killed dozens."

"That was during the war between him and Humphries. Ancient history. He hasn't attacked a crewed ship since he's been exiled."

"But suppose—"

The communications console pinged.

"Hah!" Sam gloated. "There he is now."

But the image that took form on the comm screen wasn't Lars Fuchs' face. It was Jill Myers.

She was beaming a smile that could've lit up Selene City for a month. "Sam, I've got a marvelous idea. I know you're wrapped up in some kind of mysterious mission out there in the Belt, and the wedding's only a few days off, so . . ."

She hesitated, like somebody about to spring a big surprise. "So instead of you coming back Earthside for the wedding, I'm bringing the wedding out to you! All the guests and everything. In fact, I'm on the torch ship *Statendaam* right now! We break Earth orbit in about an hour. I'll see you in five days, Sam, and we can be married just as we planned!"

To say Sam was surprised would be like saying Napoleon was disturbed by Waterloo. Or McKenzie was inconvenienced when his spacecraft crashed into the Lunar Apennines. Or—well, you get the idea.

Sam looked stunned, as if he'd been pole-axed between the eyes. He just slumped in the pilot's chair, dazed, his eyes unfocused for several minutes.

"She can't come out here," he muttered at last.

"She's already on her way," I said.

"But she'll ruin everything. If she comes barging out here Fuchs'll never come within a light-year and a half of us."

"How're you going to stop her?"

Sam thought about that for all of a half-second. "I can't stop her. But I don't have to make it easy for her to find me."

"What do you mean?"

"Run silent, run deep." With deft finger, Sam turned off the ship's tracking beacon and telemetry transmitter.

"Sam! The controllers at Ceres will think we've been destroyed!"

He grinned wickedly. "Let 'em. If they don't know where we are, they can't point Jill at us."

"But Fuchs won't know where we are."

"Oh, yes, he will," Sam insisted. "Somebody at Ceres has already given him our flight plan. Big George, probably."

"Sam," I said patiently, "you filed that flight plan with the IAA. They'll tell Judge Myers. She'll come out looking for you."

"Yeah, but she'll be several days behind. By that time, the IAA controllers'll tell her we've disappeared. She'll go home and weep for me."

"Or start searching for your remains."

He shot me an annoyed glance. "Anyway, we'll meet with Fuchs before she gets here, most likely."

"You hope."

His grin wobbled a little.

I thought the most likely scenario was that Fuchs would ignore us and Judge Myers would search for us, hoping that Sam's disappearance didn't mean he was dead. Once she found us, I figured, she'd kill Sam herself.

It was eerie, out there in the Belt. Flat-

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landers back on Earth think that the Asteroid Belt is a dangerous region, a-chock with boulders, so crowded that you have to maneuver like a kid with a computer game to avoid getting smashed.

Actually, it's empty. It's dark and cold and four times farther from the Sun than the Earth is. Most of the asteroids are the size of dust flakes. The valuable ones, maybe a few meters to a kilometer or so across, are so few and far between that you have to hunt for them. You can cruise through the Belt blindfolded and your chances of getting hit even by a pebble-sized 'roid are pretty close to nil.

Of course, a pebble could shatter your ship if it hits you with enough velocity.

So we were running silent, but following the flight plan Sam had registered with the IAA. We got to the first rock Sam had scheduled and loitered around it for half a day. No sign of Fuchs. If he was anywhere nearby, he was running as silently as we were.

"He's gotta be somewhere around here," Sam said as we broke orbit and headed for the next asteroid on his list. "He's gotta be."

I could tell that Sam was feeling Judge Myers' eager breath on the back of his neck.

Me, I had a different problem. I wanted to get that message chip away from him long enough to send a copy of it to Martin Humphries. With a suitable request for compensation, of course. Fifty million would do nicely, I thought. A hundred mil would be even better.

But how to get the chip out of Sam's pocket? He kept it on his person all the time; even slept with it.

So it floored me when, as we were eating breakfast in *Achernar*'s cramped little galley on our third day out, Sam fished the fingernail-sized chip out of his breast pocket and handed it to me.

"Gar," he said solemnly, "I want you to hide this someplace where *nobody* can find it, not even me."

I was staggered. "Why. . . ?"

"Just a precaution," he said, his face more serious than I'd ever seen it before. "When Fuchs shows up, things might get rough. I don't want to know where the chip is."

"But the whole point of this flight is to deliver it to him."

He nodded warily. "Yeah, Humphries must know we're looking for Fuchs. He's got IAA people on his payroll. Hell, half the people in Ceres might be willing to rat on us. Money talks, pal. Humphries might not know why we're looking for Fuchs, but he knows we're trying to find him."

"Humphries wants to find Fuchs, too," I said. "And kill him, no matter what he promised his wife."

"Damned right. I wouldn't be surprised if he has a ship tailing us."

"I haven't seen anything on the radar plot."

"So what? A stealth ship could avoid radar. But not the hair on the back of my neck."

"You think we're being followed?"

"I'm sure of it."

By the seven sinners of Cincinnati, I thought. This is starting to look like a class reunion! We're jinking around in the Belt, looking for Fuchs. Judge Myers is on her way, with a complete wedding party. And now Sam thinks there's an HSS stealth ship lurking out there somewhere, waiting for us to find Fuchs so they can pounce on him.

But all that paled into insignificance for me as I stared down at the tiny chip Sam had placed in the palm of my hand.

I had it in my grasp! Now the trick was to contact Humphries without letting Sam know of it.

I couldn't sleep that night. We were approaching the second asteroid on Sam's itinerary on a dead-reckoning trajectory. There were no active signals going out from the ship except for the short-range collision avoidance radar. We'd take up a parking orbit around the unnamed rock mid-morning tomorrow.

I waited until my eyes were adapted

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to the darkness of the sleeping compartment, then peeked down over the edge of my bunk to see if Sam was really asleep. He was on his side, face to the bulkhead, his legs pulled up slightly in a sort of fetal position, his breathing deep and regular.

He's asleep, I told myself. As quietly as a wraith, I slipped out of my bunk and tiptoed in my bare feet to the cockpit, carefully shutting the hatches of the sleeping compartment and the galley, so there'd by no noise to waken Sam.

I'm pretty good at decrypting messages. It's a useful talent for a con man, and I had spent long hours at computers during my one and only jail stretch to learn the tricks of the trade.

Of course, I could just offer the chip for sale to Humphries without knowing what was on it. He'd pay handsomely for a message that his wife wanted to give to Lars Fuchs.

But if I knew the contents of the message, I reasoned, I could most likely double or triple the price. So I started to work on decrypting it. How hard could it be? I asked myself, as I slipped the chip into the ship's main computer. She probably did the encoding herself, not trusting anybody around her. She'd been an astronaut in her earlier years, I knew, but not particularly a computer freak. Should be easy.

It wasn't. It took all night and I still didn't get all the way through the trapdoors and blind alleys she'd built into her message. Smart woman, I realized, my respect for Amanda Cunningham Humphries notching up with every bead of sweat I oozed.

At last the hash that had been filling the central screen on the cockpit control panel cleared away, replaced by an image of her face.

That face. I just stared at her. She was so beautiful, so sad and vulnerable. It brought a lump to my throat. I've seen beautiful women—plenty of them—and bedded more than my share. But gazing at Amanda's face, there in the quiet hum of the dimmed cockpit, I felt something more than desire, more than animal hunger.

Could it be love? I shook my head like a man who's just been knocked down by a punch. Don't be an idiot! I snarled at myself. You've been hanging around Sam too long. You're becoming a romantic jackass just like he is.

Love has nothing to do with this. That beautiful face is going to earn you millions, I told myself, as soon as you decrypt this message of hers.

And then I smelled the fragrance of coffee brewing. Sam was in the galley, right behind the closed hatch of the cockpit, clattering dishes and silverware. In a weird way, I felt almost relieved. Quickly I popped the chip out of the computer and slipped it into the waistband of the undershorts I was wearing.

Just in time. Sam pushed the hatch open and handed me a steaming mug of coffee.

"You're up early," he said, with a groggy smile.

"Couldn't sleep," I answered truthfully. That's where the truth ended. "I've been trying to think of where I could stash the chip."

He nodded and scratched at his wiry, tousled red hair. "Find a good spot, Gar. I think we're going to have plenty of fireworks before this job is finished."

Truer words, as they say, were never spoken.

The three asteroids Sam had chosen were samples of the three different types of 'roids in the Belt. The first one had been a rocky type. It looked like a lumpy potato, pockmarked with craterlets from the impacts of smaller rocks. The one we were approaching was a chondritic type, a loose collection of primeval pebbles that barely held itself together. Sam called it a beanbag.

He was saving the best one for last. The third and last asteroid on Sam's list was a metallic beauty, the one that some Latin American sculptress had carved into a monumental history of her Native

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American people; she called it "The Rememberer." Sam had been involved in that, years ago, I knew. He had shacked up with the sculptress for a while. Just like Sam.

As we approached the beanbag, our collision-avoidance radar started going crazy.

"It's surrounded by smaller chunks of rock," Sam muttered, studying the screen.

From the copilot's chair, I could see the main body of the asteroid through the cockpit window. It looked hazy, indistinct, more like a puff of smoke than a solid object.

"If we're going to orbit that cloud of pebbles," I said, "it'd better be at a good distance from it. Otherwise we'll get dinged up pretty heavily."

Sam nodded and tapped in the commands for an orbit that looped a respectful distance from the beanbag.

"How long are we going to hang around here?" I asked him.

He made a small shrug. "Give it a day or two. Then we'll head off for 'The Rememberer.'"

"Sam, your wedding is in two days." Speaking of remembering, I thought.

He gave me a lopsided grin. "Jill's smart enough to figure it out. We'll get married at 'The Rememberer.' outside, in suits, with the sculpture for a background. It'll make terrific publicity for my tour service."

I felt my eyebrows go up. "You're really thinking of starting tourist runs out here to the Belt?"

"Sure. Why not?"

"I thought that was just your cover story."

"It was," he admitted. "But the more I think about it, the more sense it makes."

"Who's going to pay the fare for coming all the way out here, just to see a few rocks?"

"Gar, you just don't understand how business works, do you?"

"But—"

"How did space tourism start in the first place?" Before I could even start thinking about an answer, he went on, "With a few bored rich guys paying millions for a few days in orbit."

"Not much of a market," I said.

He waggled a finger at me. "Not at first, but it got people interested. The publicity was important. Within a few years, there was enough of a demand so that a real tourist industry took off. It was small, at first, but it grew."

I recalled, "You started a honeymoon hotel in Earth orbit back then, didn't you?"

His face clouded. "It went under. Most of the honeymooners got spacesick their first day in weightlessness. Horrible publicity. I went broke."

"And sold it to Rockledge Industries, right?"

He got even more somber. "Yeah, right."

Rockledge made a success of the orbital hotel after buying Sam out, mainly because they'd developed a medication for space sickness. The facility is still there in low Earth orbit, part hotel, part museum. Sam was a pioneer, all right. An ornament to his profession, as far as I was concerned. But that's another story.

"And now you think you can make a tourist line to the Belt pay off?"

Before he could answer, three things happened virtually simultaneously. The navigation computer chimed and announced, "Parking orbit established." At that instant, we felt a slight lurch. Spacecraft don't lurch, not unless something bad has happened to them, like hitting a rock or getting your airtight hull punctured.

Sure enough, the maintenance program sang out, "Main thruster disabled. Repair facilities urgently required."

Before we could do more than look at each other, our mouths hanging open, a fourth thing happened.

The comm speaker rumbled with a deep, snarling voice. "Who are you and what are you doing here?"

The screen showed a dark, scowling

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face: It was jowly, almost pudgy, with dark hair pulled straight back from a broad forehead, and tiny deep-set eyes that burned into you. A vicious slash of a mouth turned down angrily. Irritation and suspicion was written across every line of that face. He radiated power, strength, and the cold-blooded ruthlessness of a killer. Lars Fuchs.

"Answer me or my next shot will blow away your crew pod."

I felt an urgent need to go to the bathroom, but Sam stayed cool as a polar bear.

"This is Sam Gunn. I've been trying to find you, Fuchs."

"Why?"

"I have a message for you."

"From Humphries? I'm not interested in hearing what he has to say."

Sam glanced at me, then said, "The message is from Mrs. Humphries."

I didn't think it was possible, but Fuchs' face went harder still. Then, in an even meaner tone, he said, "I'm not interested in anything she has to say, either."

"She seemed very anxious to get this message to you, sir," Sam wheedled. "She hired us to come all the way out to the Belt to deliver it to you personally."

He fell silent. I could feel my heart thumping against my ribs. Then Fuchs snarled, "It seems more likely to me that you're bait for a trap Humphries wants to spring on me. My former wife hasn't anything to say to me."

"But—"

"No buts! I'm not going to let you set me up for an ambush." I could practically *feel* the suspicion in his voice, on his scowling face. And something more. Something really ugly. Hatred. Hatred for Humphries and everything associated with Humphries. Including his wife.

"I'm no Judas goat," Sam snarled back. I was surprised at how incensed he seemed to be. You can never tell with Sam, but he seemed really teed off.

"I'm Sam Gunn, goddammit, not some sneaking decoy. I don't take orders from Martin Humphries or anybody else in the whole twirling solar system and if you think . . ."

While Sam was talking, I glanced at the search radar, to see if it had locked onto Fuchs' ship. Either his ship was super stealthy or it was much farther away than I had thought. He must be a damned good shot with that laser, I realized.

Sam was jabbering, cajoling, talking a mile a minute, trying to get Fuchs to trust him enough to let us deliver the chip to him.

Fuchs answered, "Don't you think I know that the chip you're carrying has a homing beacon built into it? I take the chip and a dozen Humphries ships come after me, following the signal the chip emits."

"No, it's not like that at all," Sam pleaded. "She wants you to see this message. She wouldn't try to harm you."

"She already has," he snapped.

I began to wonder if maybe he wasn't right. Was she working for her present husband to trap her ex-husband? Had she turned against the man whose life she had saved?

It couldn't be, I thought, remembering how haunted, how frightened she had looked. She couldn't be a Judas to him; she had married Humphries to save Fuchs' life, from all that I'd heard.

Then a worse thought popped into my head. If Sam gives the chip to Fuchs, I'll have nothing to offer Humphries! All that money would fly out of my grasp!

I had tried to copy the chip, but it wouldn't allow the ship's computer to make a duplicate. Suddenly I was on Fuchs' side of the argument: Don't take the chip! Don't come anywhere near it!

Fate, as they say, intervened.

The comm system pinged again and suddenly the screen split. The other half showed Judge Myers, all smiles, obviously in a compartment aboard a spacecraft.

"Sam, we're here!" she said brightly. "At 'The Rememberer.' It was so brilliant of you to pick the sculpture for our wedding ceremony!"

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"Who the hell is that?" Fuchs roared.

For once in his life, Sam actually looked embarrassed. "Um . . . my, uh, fiancée," he stumbled. "I'm supposed to be getting married in two days."

The expression on Fuchs' face was almost comical. Here he's threatening to blow us into a cloud of ionized gas and all of a sudden he's got an impatient bride-to-be on the same communications frequency.

"Married?" he bellowed.

"It's a long story," said Sam, red-cheeked.

Fuchs glared and glowered while Judge Myers' round freckled face looked puzzled. "Sam? Why don't you answer? I know where you are. If you don't come out to 'The Rememberer,' I'm going to bring the whole wedding party to you, minister and boys' choir and all."

"I'm busy, Jill," Sam said.

"Boys' choir?" Fuchs ranted. "Minister?"

Not even Sam could carry on two conversations at the same time, I thought. But I was wrong.

"Jill, I'm in the middle of something," he said, then immediately switched to Fuchs: "I can't hang around here. I've got to get to my wedding."

"Who are you talking to?" Judge Myers asked.

"What wedding?" Fuchs demanded. "Do you mean to tell me you're getting married out here in the Belt?"

"That's exactly what I mean to tell you," Sam replied to him.

"Tell who?" Judge Myers asked. "What's going on, Sam?"

"Bah!" Fuchs snapped. "You're crazy! All of you!"

I saw a flash of light out of the corner of my eye. Through the cockpit's forward window, I watched a small, stiletto-slim spacecraft slowly emerge from the cloud of pebbles surrounding the asteroid, plasma exhaust pulsing from its thruster and a blood-red pencilbeam of laser light probing out ahead of it.

Fuchs bellowed, "I knew it!" and let loose a string of curses that would make an angel vomit.

Sam was swearing, too. "Those sonsofbitches! They knew we'd be here and they were just laying in wait in case Fuchs showed up."

"I'll get you for this, Gunn!" Fuchs howled.

"I didn't know!" Sam yelled back.

Judge Myers looked somewhere between puzzled and alarmed. "Sam, what's happening? What's going on?"

The ambush craft was rising out of the rubble cloud that surrounded the asteroid. I could see Fuch's ship through the window now, because he was shooting back at the ambusher, his own red pencilbeam of a spotting laser lighting up the cloud of pebbles like a Christmas ornament.

"We'd better get out of here, Sam," I suggested at the top of my lungs.

"How?" he snapped. "Fuchs took out the thruster."

"You mean we're stuck here?"

"Smack in the middle of their battle," he answered, nodding. "And our orbit's taking us between the two of them."

"Do something!" I screamed. "They're both shooting at us!"

Sam dove for the hatch. "Get into your suit, Gar. Quick."

I never suited up quicker, but it seemed to take hours. With our main thruster shot away, dear old *Achernar* was locked into its orbit around the asteroid. Fuchs and the ambusher were slugging it out, maneuvering and firing at each other with us in the middle. I don't think they were deliberately trying to hit us, but they weren't going out of their way to avoid us, either. While I wriggled into my spacesuit and fumbled through the checkout procedure, *Achernar* lurched and quivered again and again.

"They're slicing us to ribbons," I said, trying to keep from babbling.

Sam was fully suited up; just the visor of his helmet was open. "You got the chip on you?"

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For an instant I thought I'd left it in the cockpit. I nearly panicked. Then I remembered it was still in the waistband of my shorts. At least I hoped it was still there.

"Yeah," I said. "I've got it."

Sam snapped his visor closed, then reached over to me and slammed mine shut. With a gloved hand, he motioned for me to follow him to the airlock.

"We're going outside?" I squeaked. I was really scared. A guy could killed!

"You want to stay here while they take potshots at us?" Sam's voice crackled in my helmet earphones.

"But why are they shooting at us?" I asked. Actually, I was talking—babbling really—because if I didn't, I probably would've started screeching like a demented baboon.

"Fuchs thinks we led him into a trap," Sam said, pushing me into the airlock, "and the bastard who's trying to bushwhack him doesn't want any living witnesses."

He squeezed into the airlock with me, cycled it, and pushed me through the outer hatch when it opened.

All of a sudden I was hanging in emptiness. My stomach heaved, my eyes blurred. I mean, there was nothing out there except a zillion stars, but they were so far away and I was falling, I could feel it, falling all the way to infinity. I think I screamed. Or at least gasped like a drowning man.

"It's okay, Gar," Sam said, "I've got you."

He grasped me by the wrist and, using the jetpack on his suit's back, towed me away from the riddled hulk of *Achernar.* We glided into the cloud of pebbles surrounding the asteroid. I could feel them pinging off my suit's hard shell; one of them banged into my visor, but it was a fairly gentle collision—no damage, except to the back of my head: I flinched so sharply that I whacked my head against the helmet hard enough to give me a concussion, almost, despite the helmet's padded interior.

Sam hunkered us down into the loose pile of rubble that was the main body of the asteroid. "Safer here than in the ship," he told me.

I burrowed into that beanbag as deeply as I could, scooping out pebbles with both hands, digging like a terrified gopher on speed. I would've dug all the way back to Earth if I could have.

Fuchs and the ambusher were still duking it out, with a spare laser blast now and then hitting *Achernar* as it swung slowly around the 'roid. The ship looked like a shambles, big gouges torn through its hull, chunks torn off and spinning lazily alongside its main structure.

They hadn't destroyed the radio, though. In my helmet earphones I could hear Judge Myers' voice, harsh with static:

"Sam, if this is another scheme of yours . . ."

Sam tried to explain to her what was happening, but I don't think he got through. She kept asking what was going on and then, after a while, her voice cut off altogether.

Sam said to me, "Either she's sore at me and she's leaving the Belt, or she's worried about me and she's coming here to see what's happening."

I hoped for the latter, of course. Our suits had air regenerators, I knew, but they weren't reliable for more than twenty-four hours, at best. From the looks of poor old *Achernar,* we were going to need rescuing and damned soon, too.

We still couldn't really see Fuchs' ship. It was either too far away in that dark emptiness or he was jinking around too much for us to get a visual fix on him. I saw flashes of light that might have been puffs from maneuvering thrusters, or they might have been hits from the other guy's laser. The ambusher's craft was close enough for us to make out, most of the time. He was viffing and slewing this way and that, bob-

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bing and weaving like a prizefighter trying to avoid his opponent's punches.

But then the stiletto flared into sudden brilliance, a flash so bright it hurt my eyes. I squeezed my eyes shut and saw the after-image burning against my closed lids.

"Got a propellant tank," Sam said, matter-of-factly. "Fuchs'll close in for the kill now."

I opened my eyes again. The stiletto was deeply gashed along its rear half, tumbling and spinning out of control. Gradually it pulled itself onto an even keel, then turned slowly and began to head away from the asteroid. I could see hot plasma streaming from one thruster nozzle. The other was dark and cold.

"He's letting him get away," Sam said, sounding surprised. "Fuchs is letting him limp back to Ceres or wherever he came from."

"Maybe Fuchs is too badly damaged himself to chase him down," I said.

"Maybe." Sam didn't sound at all sure of that.

We waited for another hour, huddled inside our suits in the beanbag of an asteroid. Finally Sam said, "Let's get back to the ship and see what's left of her."

There wasn't much. The hull had been punctured in half a dozen places. Propulsion was gone. Life support shot. Communications marginal.

We clumped to the cockpit. It was in tatters; the main window was shot out, a long ugly scar from a laser burn right across the control panel. The pilot's chair was ripped, too. It was tough to sit in the bulky spacesuits, and we were in zero gravity, to boot. Sam just hovered a few centimeters above his chair. I realized that my stomach had calmed down. I had adjusted to zero gee. After what we had just been through, zero gee seemed downright comfortable.

"We'll have to live in the suits," Sam told me.

"How long can we last?"

"There are four extra air regenerators in stores," Sam said. "If they're not damaged we can hold out for another forty-eight, maybe sixty hours."

"Time enough for somebody to come and get us," I said hopefully.

I could see his freckled face bobbing up and down inside his helmet. "Yep . . . provided anybody's heard our distress call."

The emergency radio beacon seemed to be functioning. I kept telling myself we'd be all right. Sam seemed to feel that way; he was positively cheerful.

"You really think we'll be okay?" I asked him. "You're not just trying to keep my hopes up?"

"We'll be fine, Gar," he answered. "We'll probably smell pretty ripe by the time we can get out of these suits, but except for that, I don't see anything to worry about."

Then he added, "Except . . ."

"Except?" I yelped. "Except what?"

He grinned wickedly. "Except that I'll miss the wedding." He made an exaggerated sigh. "Too bad."

So we lived inside the suits for the next day and a half. It wasn't all that bad, except we couldn't eat any solid food. Water and fruit juices, that was all we could get through the feeder tube. I started to feel like a Hindu ascetic on a hunger strike.

We tried the comm system, but it was intermittent, at best. The emergency beacon was faithfully sending out our distress call, of course, with our position. It could be heard all the way back to Ceres, I was sure. Somebody would come for us. Nothing to worry about. We'll get out of this okay. Someday we'll look back on this and laugh. Or maybe shudder. Good thing we had to stay in the suits; otherwise I would have gnawed all my fingernails down to the wrist.

And then the earphones in my helmet suddenly blurted to life.

"Sam! Do you read me? We can see your craft!" It was Judge Myers. I was so overjoyed that I would have married her myself.

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Her ship was close enough so that our suit radios could pick up her transmission.

"We'll be there in less than an hour, Sam," she said.

"Great!" he called back. "But hold your nose when we start peeling out of these suits."

Judge Myers laughed and she and Sam chatted away like a pair of teenagers. But then Sam looked up at me and winked.

"Jill, I'm sorry this has messed up the wedding," he said, making his voice husky and sad. "I know you were looking forward to—"

"You haven't messed up a thing, Sam," she replied brightly. "After we've picked you up—and cleaned you up—we're going back to 'The Rememberer' and have the ceremony as planned."

Sam's forehead wrinkled. "But haven't your guests gone back home? What about the boys' choir? And the caterers?"

She laughed. "The guests are all still here. As for the entertainment and the caterers, so I'll have to pay them for a few extra days. Hang the expense, Sam. This is our wedding we're talking about! Money is no object."

Sam groaned.

In a matter of hours, we were aboard Judge Myers' ship, *Statendaam,* showered, shaved, clothed and fed, heading to 'The Rememberer' and Sam's wedding. Sam was like Jekyll and Hyde: While he and I were alone together, he was morose and mumbling, like a guy about to face a firing squad in the morning. When Judge Myers joined us for dinner, though, Sam was chipper and charming, telling jokes and spinning tall tales about old exploits. It was quite a performance; if Sam ever goes into acting, he'll win awards, I'm sure.

After dinner Sam and Judge Myers strolled off together to her quarters. I went back to the compartment they had given me, locked the door, and took out the chip.

It was easier this time, since I remembered the keys to the encryption. In less than an hour, I had Amanda's hauntingly beautiful face on the display of my compartment's computer. I wormed a plug into my ear, taking no chances that somebody might eavesdrop on me.

The video was focused tightly on her face. For I don't know how long, I just gazed at her, hardly breathing. Then I shook myself out of the trance and touched the key that would run her message.

"Lars," she said softly, almost whispering, as if she were afraid somebody would overhear her, "I'm going to have a baby."

Holy mother in heaven! It's a good thing we didn't deliver this message to Fuchs. He would've probably cut us into little pieces and roasted them on a spit.

Amanda Cunningham Humphries went on, "Martin wants another son. He already has a five-year-old boy by a previous wife."

She hesitated, looked over her shoulder. Then, in an even lower voice, "I want you to know, Lars, that it will be your son that I bear, not his. I've had myself implanted with one of the embryos we froze at Selene, back before all these troubles started."

I felt my jaw drop down to my knees.

"I love you, Lars," Amanda said. "I've always loved you. I married Martin because he promised he'd stop trying to kill you if I did. I'll have a son, and Martin will think it's his, but it will be your son, Lars. Yours and mine. I want you to know that, dearest. Your son."

Humphries would pay a billion for that, I figured.

And he'd have the baby Amanda was carrying aborted. Maybe he'd kill her, too.

"So what are you going to do about it, Gar?"

I whirled around in my chair. Sam was standing in the doorway.

"I thought I locked—"

"You did. I unlocked it." He stepped

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into my compartment and carefully slid the door shut again. "So, Gar, what are you going to do?"

I popped the chip out of the computer and handed it to Sam.

He refused to take it. "I read her message the first night on our way to the Belt," Sam said, sitting on the edge of my bed. "I figured you'd try to get it off me, one way or another."

"So you gave it to me."

Sam nodded gravely. "So now you know what her message is. The question is: what are you going to do about it?"

I offered him the chip again. "Take it, Sam. I don't want it."

"It's worth a lot of money, Gar."

"I don't want it!" I repeated, a little stronger.

Sam reached out and took the chip from me. Then, "But you know what she's doing. You could tell Humphries about it. He'd pay a lot to know."

I started to reply, but to my surprise I found that I had to swallow hard before I could get any words out. "I couldn't do that to her," I said.

Sam looked square into my eyes. "You certain of that?"

I almost laughed. "What's a few hundred million bucks? I don't need that kind of money."

"You're certain?"

"Yes, dammit, I'm certain!" I snapped. It wasn't easy tossing away all that money, and Sam was starting to irritate me.

"Okay," he said, breaking into that lopsided smile of his. "I believe you."

Sam got to his feet, his right fist closed around the chip.

"What will you do with it?" I asked.

"Pop it out an airlock. A few days in hard UV should degrade it so badly that even if somebody found it in all this emptiness, they'd never be able to read it."

I got up from my desk chair. "I'll go with you," I said.

So the two of us marched down to the nearest airlock and got rid of the chip. I had a slight pang when I realized how much money we had just tossed out into space, but then I realized I had saved Amanda's life, most likely, and certainly the life of her baby. Hers and Fuchs'.

"Fuchs will never know," Sam said. "I feel kind of sorry for him."

"I feel sorry for her," I said.

"Yeah. Me too."

As we walked down the passageway back toward my compartment, curiosity got the better of me.

"Sam," I asked, "what if you weren't sure that I'd keep her message to myself? What if you thought I'd sneak off to Humphries and tell him what was on that chip?"

He glanced up at me. "I've never killed a man," he said quietly, "but I'd sure stuff you into a lifeboat and set you adrift. With no radio."

I blinked at him. He was dead serious.

"I wouldn't last long," I said.

"Probably not. Your ship would drift through the Belt for a long time, though. Eons. You'd be a real Flying Dutchman."

"I'm glad you trust me."

"I'm glad I can trust you, Gar." He gave me a funny look, then added, "You're in love with her, too, aren't you?"

It took me a few moments to reply, "Who wouldn't be?"

So we flew to 'The Rememberer' with Judge Myers and all the wedding guests and the minister and boys' choir, the caterers and all the food and drink for a huge celebration. Six different news nets were waiting for us: the wedding was going to be a major story.

Sam snuck away, of course. He didn't marry Jill Myers after all. She was so furious that she . . .

But that's another story. ■

(EDITOR'S NOTE: Earlier stories of Sam Gunn include "Tourist Sam," [March 1998], "Nursery Sam" [January 1996], and "Sam's War" [July 1994].)

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THE REFERENCE LIBRARY Tom Easton

Arguing A.I.: The Battle for Twenty-First-Century Science, Sam Williams, Random House (AtRandom.com), $15.95, 97 + xxvi pp. (ISBN: 0-8129-9180-X).

Flesh and Machines: How Robots Will Change Us, Rodney A. Brooks, Pantheon, $26, 261 + x pp. (ISBN: 0-375-42079-7).

What Does a Martian Look Like? The Science of Extraterrestrial Life, Jack Cohen and Ian Stewart, Wiley, $27.95, 369 + xiv pp. (ISBN: 0-471-26889-5).

Crossfire, Nancy Kress, TOR, $24.95, 364 pp. (ISBN: 0-765-30467-8).

Engine City, Ken MacLeod, TOR, $24.95, 304 pp. (ISBN: 0-765-30502-X).

Darwin's Children, Greg Bear, Ballantine Del Rey, $24.95, 385 pp. (ISBN: 0-345-44835-9).

Jubilee, Jack Dann, TOR, $27.95, 442 pp. (ISBN: 0-765-30676-X).

The idea that human beings might be able to make objects that act in human ways goes back a very long time. Even the medieval golem—a mass of clay animated by the name of god—was not the first. The objects became machines in the nineteenth century, with clockwork as the animating principle. The word "robot" was coined by Karel Capek in 1921. In 1943, researchers began describing the brain as a switchboard-like electrical network. By 1950, the first computers were stimulating their makers to think of "artificial intelligence" and Alan Turing had devised the "imitation game" (better known today as the Turing test) to tell whether a machine was in fact intelligent.

A definition of intelligence was clearly in order, but that has been as hard to come by as artificial intelligence itself. Initially, it was taken to mean whatever people do with their brains. Math? Computers were too good at that from the get-go. Logic? Alas, that fell early to the computers, with Logic Theorist (1956) and the General Problem Solver (1957). Chess? The basic algorithms were worked out by Claude Shannon in 1950, and it wasn't long at all before a machine could play well enough to qualify as a "patzer" (as well as most humans). Deep Blue trounced world champion Garry Kasparov in 1997, and in 2002, Deep Fritz played champion Vladimir Kramnik to a draw to uphold the title.

There has been a distinct tendency of critics to say that if a machine can do something, that something is not due to *real* intelligence. But we can do better than that: computers typically do one thing well; humans do many, which suggests that multiplicity of ability is essential to a good definition. For computers, that multiplicity has been elusive. Will we ever achieve it? Arguments rage, with people like Roger Penrose and John Searle arguing in effect that if it ain't meat, it can't think. Marvin Minsky, Hans Moravec, and Ray Kurzweil, among others, think it's only a matter of time. Bill Joy is afraid they're right, and we should therefore put a stop to the research before our creations do us in.

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That is a brutal compression of the history of A.I., but it gives the gist. For more, read Sam Williams's **Arguing A.I.: The Battle for Twenty-First-Century Science**, which tracks the origins of A.I. to 1900 (when mathematician David Hilbert laid the foundations of twentieth-century mathematics), follows it through the extraordinarily fertile period of the 50s, and on to today. Williams's focus is less on the technicalities than on the general ideas, personalities, and debates, and at the end, he encourages us to think of artificially intelligent machines as mirrors of ourselves and of A.I. research as—in part—an exercise in vanity.

Indeed, it is easy to see the critics of A.I. as motivated by their own vanity. Many—like Penrose and Searle—seem offended at the very idea that a machine might be able to duplicate the performance of their refined brains. At the same time, those—like Moravec and Kurzweil—who forecast a time when it will be possible to copy the human mind into a computer always seem to set the day of that possibility at about the time when the forecaster will turn seventy, which suggests a powerful role for wish fulfillment. Or so says Rodney A. Brooks, in **Flesh and Machines: How Robots Will Change Us**.

But that's not all that Brooks says. Hans Moravec noted years ago that mental abilities have been embarrassingly easy to match in software, but physical abilities such as walking and navigating have been much harder; he therefore focused his attention on robotics. However, the robots of Moravec (and many others) have been designed to build internal landscape maps and plan ahead for whole sequences of movements, making them slow and clumsy. Brooks has also focused on robotics, but he saw early on that onboard computation to model the world outside the robot was unnecessary and even counter-productive. The world was its own model in a sense, and a robot could be designed to consult that model instead.

How? Reflexes, just the way a bug does it. Don't worry about where the wall is. Go ahead and bump it. Then back up and change direction. Don't worry about bumps and holes in the path. Go ahead, take a step, and if the foot stops too soon or goes too far, adjust balance and keep moving. The result has been remarkably insectile robots that scuttle vigorously about the lab and—marketed by Brooks's company, iRobot, just in time for last Christmas—the Roomba robotic vacuum cleaner.

That's hardly the end of it. Brooks expects A.I. and robotics to continue to develop. He does not think we need to worry about independent A.I.s taking over or septuagenarians uploading their minds into brainboxes. Rather, he says, we will incorporate the technology to enhance our abilities in many ways and "The distinction between us and robots is going to disappear."

Brooks has a fascinating vision made credible by impressive success in creating autonomous and semi-autonomous devices. Read the book, and keep an eye on him—perhaps especially if you like to play the market.

Me, I'll keep watching because I'm a teensy bit jealous. Back in the 70s and early 80s, I wrote several papers (including two in *Robotics Age* in 1984) which discussed using reflexes for robotic control. I never tried to turn the ideas into actual devices. If I had . . . Well, "what might have been" is thin comfort, not worth dwelling on, and I really am happy to know the approach works. So what will Brooks do next?

Jack Cohen is a British biologist, enthusiastic and insistent in manner, who has consulted with a great many SF writers who wished to get their aliens right. Not that he knows what aliens are like, but he is quite good at considering worlds and the environment and evolution, fitting the bits together, and coming up with something that feels like it

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might really exist somewhere. He has worked with Anne McCaffrey, Harry Harrison, Larry Niven, David Gerrold, and many more.

It is therefore hardly surprising that he and friend, mathematician, and collaborator Ian Stewart—or perhaps the entity they refer to as "Jack&Ian"—should write a book called **What Does a Martian Look Like? The Science of Extraterrestrial Life**, but the book began long before Jack&Ian got together. Indeed, its roots are in a lecture Jack started giving way back in 1958, "What Does a Martian Look Like?," which was later and more soberly renamed "The Possibility of Life on Other Planets" and given a great many times over the years, always incorporating new material and staying up to date.

Jack&Ian do not care for the modern business of "astrobiology," which they say is far too firmly based in the familiar. That is, astrobiologists look for life as they know it here on Earth. Better, perhaps, is "xenoscience," which admits the possibility of other forms of life, rooted in virtuality ("artificial life") or solar plasmas or . . . who knows? The key, they say, is pattern and complexity and even chaos (the subject of another Jack&Ian book).

But our imaginations are necessarily limited in such matters. We serve the cause better if we bear in mind that the key word is variety, not sameness, and recognize that even here on Earth there is a quite astonishing variety of shape and habit. If one wishes to advise an SF writer, one need only find a terrestrial bizarrity or two, mix a bit of this with a tot of that, and *then* remember that since every variation is fitted to its environment by natural selection, there must be an environment in which our mix makes genuine sense. Far too many devisers of aliens forget that requirement.

What about intelligence? Or "extelligence," which refers to technology and culture? Again, variety is likely, and we must struggle to escape our parochial biases. And within another century or so—perhaps after we (following Rodney Brooks's suggestion) "change our selves so that our descendants are very different, very alien compared to what we are now"—we may be able to visit other worlds to see what the neighbors (if any) are like.

Jack&Ian have done an admirable job of pulling together a great many developments from modern biology, chemistry, and astronomy to show the vast breadth of living possibility that awaits discovery. At the same time and as excellently, they remind us that man is not the measure of all things: there are universals, but they are not our familiar forms and chemistries. Those are mere parochials, not to be held too high just because they are all we have at the moment.

This is a book for everyone who writes or reads SF and fantasy. Both will learn from it; the writers will then create better worlds and aliens, which the readers will then appreciate. As for the writers who ignore the book—I expect they will find their readers grown much more demanding, which will serve us all well.

The aliens in Nancy Kress's **Crossfire** might well have been created using Jack and Ian's book as a guide. The bad guys are the humanoids; the good guys look sort of like plants, sort of like slime molds, unfamiliar in both form and chemistry.

But first the setup: Jake Holman is a lawyer with a dark secret in his past, but that hasn't kept him from organizing an interstellar colony. His colonists are not the persecuted minorities who once fled Europe for the Americas, but wealthy faux-Cheyenne, a deposed Arabic royal family, a delegation of Quakers, and assorted millionaire eccentrics. Their ship is the *Ariel*, their destination the world of Greentrees, certified free of indigenes by a robotic probe. The jour-

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ney is marred only by a single psychotic crisis and a possible sighting of a strange—alien?—starship, and then they are there, breathing clean air, gazing upon open spaces, and listening to the news of chaos and breakdown back home. They seem to have escaped just in time.

They have brought some problems with them, of course. The Quaker leader, Dr. William Shipley, finds his daughter, Naomi—full of rebellion and antipathy—among the colonists. The Arabs keep their women out of sight. The Cheyenne are planning to leave the colony to return to Nature and live the way their Earthly predecessors once lived. And then they discover the "natives."

They are humanoid and furry, but neither curious nor communicative. Call them "Furs." Naomi Shipley adopts them as her own pet project and soon thinks she's learning to communicate with them. But then another group turns up, physically identical but aggressive, to get into a killing fight with the Cheyenne. Then another, still Furs, but acting permanently zoned, as if on drugs.

What's going on? It's a mystery, until the "Vines" show up. They respond well to Dr. Shipley's Quakerish approach—he insists the humans sit in silence—and when they produce a translator device, it doesn't take long to reveal that the Furs have been genetically modified by the Vines. The Furs are their age-old enemy, and they are trying to find a way to make them harmless.

This quite upsets Naomi, who calls it genocide, neglecting that the Vines don't want to kill. That's when the unmodified Furs show up and slaughter the Vines, kidnap a party of humans, and insist quite firmly that the humans help them slaughter the entire Vine species. After all, they say, the Vines are evil, abominations. Like Naomi, perhaps, they think it worse to modify than to destroy.

Is it? The Vines are not destroying the Fur species, but they are surely destroying the Fur-ness of the Furs. We might have an Earthly parallel if someone came up with a virus that robbed all people of color of their color. Most of us would surely be horrified. Yet the Vines are as much the targets of the Furs' destructive urges as the Jews were of the Nazis'. Perhaps a better parallel would be—set this parable about 1940, if you will—a Jewish scientist who came up with a virus that robbed the Nazis of their racism. This too destroys the essence of who the person is, but surely in this case few of us would object.

To do such a thing gratuitously, just to bring the world more in line with our prejudices, would be heinous. To do it, lacking any alternative save annihilation of the foe, to stave off one's own annihilation, must be counted regrettable but necessary. Form and chemistry, say Jack and Ian, are parochials, only locally relevant. Universals are such things as the requirement for inputs of material and energy, natural selection, and of course self-preservation.

Should the kidnapped humans help the Furs? Or defeat them and help the Vines? I won't tell you my thought, nor even Nancy Kress's. Think about it for a bit, remember that this author has been consistently thought-provoking through many novels (most recently *Probability Moon*, *Probability Sun*, and *Probability Space*, reviewed here in October 2000, January 2002, and February 2003, respectively), and then go out and find a copy.

But first, bow your head for a moment. Nancy Kress's husband, Charles Sheffield, died November 16, 2002. His fiction was long an ornament to the genre. He will be missed by many more than his family and friends.

Ken MacLeod's *The Engines of Light* trilogy began with *Cosmonaut Keep*, which introduced us to a cosmos dominated by ancient life forms who reside

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in asteroids and comets, seething planetary interiors, and Oort-cloud iceballs. Biological creatures that reside on planetary surfaces—like we do—are rare. Yet here are krakens and saurs, who powerfully resemble the greys of saucerite lore and are in fact responsible for all those alien abductions we hear about. And others as well, reaching back to the days of *Homo neandertalensis* and *Paranthropus robustus* and more, all of whom now coexist more or less happily on a host of worlds among the stars.

In *Keep*, a group of modern astronauts (or cosmonauts in this future) discovered one of the gods and was handed the blueprints for a stardrive. They equipped their space station with the gadget, took off to discover the above, and scattered among the hominid worlds. Quite intriguingly, they turned out to be immortal, and at least a few couldn't resist stirring the political pot. In *Dark Light*, that meant chaos among the descendants of the Roanoke colonists (some folks always knew, you know!) while the folks from Mingulay, who have learned how to build starships they can control, interview one of the local gods and learn some disturbing things.

Now, in the final volume, **Engine City**, cosmonaut Grigory Andreievich Volkov and his allies come to Nova Babylonia, the capital world of galactic civilization, bent on prodding the local savants into discovering the secret of immortality and building defenses against the aliens who are on their way. He succeeds, at least in the latter, if not quite in the way he anticipated. Meanwhile, others are meeting the aliens and finding them less alarming than anticipated. Soon the Mingulayans have incorporated them into the Bright Star Cultures and are off to bring enlightenment to a quite paranoid, heavily armed, and renamed New Babylon.

There are characters, of course. They even have names and roles. But they are every one forgettable. What carries this book—and the series—is the big picture: The sweep of history from before the age of dinosaurs into the future, the encounters of species, the struggle to form a pluralistic culture with room for very different folks. MacLeod doesn't extend this quite as far as the gods in the asteroids, etc., but perhaps one day . . .

He is, after all, optimistic enough to end the book with a rather neat reversal of the last line of Arthur C. Clarke's "The Nine Billion Names of God."

Among the fascinating discoveries that have followed the elucidation of the human genome (and others) has been the presence of numerous viruses—in whole and in part—embedded among the genes that define us. Why are they there? One idea is that they are the remnants of ancient infections, in particular of retroviruses which like herpes and HIV have the ability to insert themselves in our DNA strands and lie doggo until some event (such as stress) awakens them once more, perhaps even generations later. These "endogenous retroviruses" do not, however, seem to be all bad. True, they may give ancient plagues a new chance at life, and they may swap genes with other viruses (much as flu viruses when duck and pig flus meet in Chinese pigs). They may also transport genes between species, as well as provide a sort of "surplus" DNA which can be modified by mutation and selection without risking more established or normal genes. They may thus aid evolution. They may also play essential roles in our biology without being subsumed.

Is it all random happenstance? Or is there pattern, even design? Greg Bear's *Darwin's Radio* suggested at least a pattern: Even as disease erupted, a new kind of child was born, equipped with pigment-flashing skin and pheromonic communications. And there was not just one such child: They were born by the thousands, without obvious causative

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connection.

Call them "virus children," and watch how they empower fear, panic, and political repression. As the sequel, **Darwin's Children**, opens, Mitch and Kaye Rafelson (pivotal figures from the earlier book) are worrying about their daughter, Stella, a virus child. They have kept her safe by keeping a low, reclusive profile in rural Virginia, but now, on the verge of puberty, Stella is rebellious. She wants to be with others of her kind.

So she runs away and is kidnapped by bounty hunters, who plan to turn her over to the government-run "schools," or concentration camps, where the virus children are sequestered and feared and studied. Meanwhile, Christopher Dicken is visiting Fort Detrick to hear "People died . . . Isn't that enough to make us . . . crazy?" Mark Augustine is visiting the Office of Special Reconnaissance to hear "We've found Kaye Lang" or Kaye Rafelson, who once had been the first to discover the problem; they've also found Stella, and they're gloating at the thought of getting her into a camp. Mitch is visiting a politician who has long resisted the paranoid right and hearing that it is getting worse.

Bear spends enough time with Stella—and in time, with other virus children at the camps—to make it clear that they are human, humane, in some ways much more so than the older model. Yet, he says, the paranoid right cannot see anything but fear, and the road to political power that it opens. There are also unscrupulous scientists who relish the thought of dissecting children in search of mysteries and—perhaps even better—new plagues for use in biowar.

To Bear's credit, he knows that though the pattern is familiar, it is by no means permanent. Political insanity waxes and wanes; sanity returns, for excess is its own foe—people come to their senses, resistance takes shape, science better reveals truth. But it takes time, and events are painful for Mitch, Kaye, Stella, Dicken, Augustine, and many more. The pain is what maintains the reader's sympathies throughout the tale, until the pattern can be fulfilled.

I asked above whether design could possibly be behind the viruses. It seems unlikely that the viruses would have the same effects—produce the same children—in thousands of independent cases, if there were no such thing. Bear has Kaye Rafelson experience an epiphany—a sense of immanence, of all-accepting love and approval. There is no divine message, but there is a hint of intent or a plan.

I found this hard to accept, but that's me, not Bear or his story. Given the world in which we live, such speculations have as much validity as those about viruses that are essential to development and evolution. Grant him that, and you will find this one a very satisfying book.

Jack Dann offers a collection of seventeen prize items from the last twenty-five years of his career in **Jubilee**. Many are familiar, all are excellent, and you cannot possibly consider the price of this one wasted. Dann is a master storyteller who writes flawlessly and movingly, often of characters in existential or spiritual jams (as in *Counting Coup*, reviewed here in May 2002). ■

You don't tell deliberate lies, but sometimes you have to be evasive.

—Margaret Thatcher

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BRASS TACKS

Dear Dr. Schmidt:

Jeffery Kooistra's column in your December 2002 issue, "How Not To Do Aether Theory," criticizes the experimental and theoretical work of Dr. Paulo and Alexandra Correa, whose exemplary plasma physics—and more recent work on the Reich-Einstein and the Hyborac/Stirling experiments—has been profiled in *Infinite Energy*, beginning in 1996. For *Analog* readers who would like a proper overview of the Correa work, I suggest they read "The Correas: An Appreciation of their Science and Technology," my report posted at their site ("http://www.aetherometry.com"). A DVD is also now available, covering the operation of their patented, Pulsed Abnormal Glow Discharge reactors (PAGD™), which generate massive, experimentally documented, excess electrical energy, and the more recent "Aether Motors," which do not rely on gas discharge processes or any conventionally understood input power source. A radical, but careful experimentally-based revision in basic physics is in the works. Yes, Copernican-like revolutions do occur from time-to-time, and this will very likely be one of them. *Analog* readers are advised that the underlying physics of the technologies foretold in many science fiction stories is being explored in-depth right now, and this is no fiction!

Given Mr. Kooistra's talent as a science fiction writer with an interest in advanced physics, it is surprising that he throws his hands up when confronting the Correa work. He writes, "... I don't understand a damn thing about what it is they say they are doing." But that admitted ignorance of basic facts and elaborate experiment descriptions—which others with technical backgrounds and interest have grasped and appreciated—doesn't deter him from faulting the experimental technique of the Correas. He evidently did not carefully read the actual description of the Reich-Einstein experiment performed by the Correas, which was published in *IE* #37, May/June 2001 ("The Reproducible Thermal Anomaly of the Reich-Einstein Experiment Under Limit Conditions"), since he improperly describes the experiment's basic protocol and controls. Kooistra brings up the red herring of "RF interference" to debunk their experiment, without making the slightest attempt to determine—either by easy calculation or by a search of the Correas' monographs on their Web site for further insight—whether this bogus "explanation" of the thermal anomaly above the Faraday cage could possibly be correct. It is not.

In closing, let me say that I was very glad to have been allowed space for "Cold Fusion: The 'Miracle' Is No Mistake," in *Analog* (July/August 1997). That science has progressed much further and the 10th International Conference on Cold Fusion (ICCF10) will be held August 24-29, 2003 at the Royal Sonesta Hotel near MIT, which should be accessible to many *Analog* readers. It is clear to me now that LENR (a.k.a. "cold fusion") is by no means the *only* potentially technologically useful new energy source. Aether energy, as it is

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manifested in already operating laboratory devices, appears to be a more direct, and possibly much less problematic source of tapping the environment for electricity and heat.

Dr. Eugene F. Mallove
Editor-in-Chief,
Infinite Energy Magazine
Concord, NH

Dear Dr. Schmidt,

We read in *Analog* (December, 2002), Jeff Kooistra's attack on our replication of what we have called the Reich-Einstein experiment. The Kooistra feature states that Reich, in the experiment he presented for Einstein to replicate, used a suspended Faraday cage. As is clear from our article, we alone did that, as one of the missing controls! The original Reich-Einstein experiment did not involve suspension. And it did not involve a Faraday cage—not per se—but an ORAC, which Einstein, on his own, proceeded to dismantle by removing the insulation panels, effectively converting it into a simple Faraday cage.

Kooistra makes this remarkable prediction: "Put a Faraday cage inside another Faraday cage and the interior won't have any local (RF) signals to null out, and hence no temperature difference"! This is precisely what we have done in the companion report (Correa, P & Correa, A, 2001, "The thermal anomaly in ORACs and the Reich-Einstein experiment: implications for blackbody theory," Akronos Publishing, monograph AS2-05, at www.aetherometry.com), demonstrating how the difference not only remains but can be made to increase! So Kooistra's prediction is not only wrong, but is also dated.

Kooistra knows that the temperature difference is there—because Einstein and Infeld both saw it, and the Correas and Mallove report it. So he plays it safe and accepts that there is a positive temperature difference, but that it is not anomalous but artifactual, because it could simply be created by absorption of ambient RF. But could it? Kooistra never bothers to check this assertion.

For *Analog* readers who want to learn the facts, we have posted on our web site the actual detailed facts and calculations. The ambient levels of the so-called RF radiation normally encountered in urban and semi-urban environments are far below the levels required to produce significant heating of our bodies or the objects all around us. As we verified it, the stringent Reich-Einstein experiment presents positive temperature differences on the order of 0.05 to 0.4 °C (*Infinite Energy*, Vol. 7, #37, p.18.). Given that the Faraday cages (8-inch cubes) we tested were suspended in the air and have highly reflective surfaces, we can expect at least 50% of the so-called RF to be reflected. A more realistic figure for the receiving efficiency of the antenna would be 15% of the incoming flux. The maximum power of thermal dissipation one could normally extract from exposure of those cages to the typical environmental RF flux is, by calculation, 0.001 watt.

Our posted calculations and tests show that to sustain a $\Delta T = 0.4°C$ in a naked, suspended Faraday cage for one hour would require 73 joules of energy—more than one order of magnitude greater than that mundane 'RF source' can supply. Other tests (Correa, P & Correa, A, 2001, "(Re-) examination of the energy radiation output by Tesla coils," Akronos Publishing, monograph AS2-13, at www.aetherometry.com) show that for that suspended experimental thermometer (at 1 cm above the cage) to reach a $\Delta T = 0.4°C$ and maintain it for a single hour, the top plate would have to function as a point source dissipating about 0.125 watts, or over 2 orders of magnitude more than the mundane 'RF heating' could account for. Since the thermometer was suspended at 3 cm above the plate, the power at the source would have to be even greater than that.

Measurements with an RF meter and the same cages (as antennas) in the

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same test environment actually place the total RF flux incident upon each cage at less than 0.0004 watts. The mundane RF facts of life are negligible and insignificant when confronted with the magnitude of the thermal differences.

Kooistra states that if one wants to read about the "long-ago-discredited" orgone energy "in detail," "just do a web search on it—you'll likely find much more information on it than you care to." The truth is that, aside from our work and one's own critical reading of Reich's work, you will find no information of any value—for, besides us, no one actually *knows* this orgone—or is capable of defining it scientifically and mathematically, and proving experimentally its existence. Those who have made the effort to read our monographs know exactly what orgone energy means and what its spectrum is.

Paulo N. Correa, M.Sc., PH.D.
Alexandra Correa, HBA
Concord, ON
Canada

Dear Stan,

What's prompted this suggestion is the cover of the January 2003 issue, which reached me recently. It's not obvious what it represents, apart from some kind of atmosphere entry, but I've just found the complete painting by Michael Carroll in the "Astronomy Now 2003 Yearbook." It turns out to be Galileo's coming immersion in the atmosphere in Jupiter. In the full painting we can see the rim and cloud belts of the planet, and two moons in the background with Io easily identifiable, but they're not in the close-up on the spacecraft on the *Analog* cover. As I remember, *Analog*'s title page stopped identifying the subject of the cover five or six years ago when a number of generic covers were carried, not relating to any particular story or article. Sometimes the subject is recognizable, e.g. David A. Hardy's December 2002 cover presumably relates to Ben Bova's article "The New Outlook for Astrobiology," but in cases like January's, the information would be helpful. *Fantasy & Science Fiction* still identifies its cover subjects, and although the link to the contents is often obvious even without that, in other cases like the Chesley Bonestell cover, March 2001, it's helpful to know that it's not illustrating any particular story

Duncan Lunan

Actually, we identify covers exactly as much and in the same way we always have. If the type on the cover begins with a story title and author, the cover illustrates the story. If it doesn't—i.e., if the cover lists only authors—then the cover is "standalone." ■

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UPCOMING EVENTS Anthony Lewis

30 May–1 June 2003
CONCAROLINAS 2003 (Carolina area SF conference) at Marriott Executive Park, Charlotte NC. Guests: Karen Taylor, Andy Duncan, Scott Nicholson, d.g.b. goldberg. Registration: $25 until 1 May 2003, then $35. Info: ConCarolinas, PMB 2004, 401 Hawthorne Ln., Ste. 110, Charlotte NC 28204; concarolinas@yahoo.com; www.secfi.org/concarolinas

6–8 June 2003
DUCKON 12 (SF conference with stress on YA and children's literature) at Radisson Hotel Lincolnwood, Chicago IL. Guest of Honor: Tanya Huff. Artist Guest of Honor: Patricia D. Breeding-Black. Filk Guests of Honor: Bill & Brenda Sutton. Mad Scientist Guest of Honor: Trace Beaulieu. Fan Guest of Honor: Jim Rittenhouse. Registration: $35 until 1 May 2003, $50 thereafter. Info: DucKon 12, Box 4843, Wheaton IL 60189; info@duckon.org; www.duckon.org

6–8 June 2003
KONNIPTION (formerly Conjuration, central Missouri SF conference) at Ramada Inn, Columbia MO. Guest of Honor: James Rollins/James Clemens. MCs: Susan Eisenhower, Zo Allen. Fan Guest of Honor: Jeff Orth. Registration: $20 until 30 April 2003, $30 thereafter. Info: CMSFE, Box 1345, Columbia MO 65205-1345; www.konniption.org

3–6 July 2003
WESTERCON 56 (West coast science fantasy conference) at SeaTac DoubleTree Hotel, SeaTac WA. Guest of Honor: Bruce Sterling. Artist Guest of Honor: Lisa Snellings. Science Guest of Honor: Dr. Michio Kaku. Editor Guest of Honor: Claire Eddy. Fan Guest of Honor: Saul Jaffe. TM: Connie Willis. Registration: $75. Info: Westercon 56, Box 1066, Seattle WA 98111; +1.206.723.9906; fax: +1.206.374.2188; info@wester56.org; www.wester56.org

28 August–1 September 2003
TORCON 3 (61st World Science Fiction Convention) at Metro Toronto Convention Centre, Royal York Hotel (and others), Toronto, Ontario, Canada. Guests of Honor: George R.R. Martin, Frank Kelly Freas, Mike Glyer. GoHst of Honor: Robert Bloch. TM: Spider Robinson. Registration: Attending CAD250/USD170, Supporting CAD60/USD40, Child CAD60/USD40. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Info: Torcon 3, Box 3, Station A, Toronto, Ontario M5W 1A2, Canada; info@torcon3.on.ca; www.torcon3.on.ca [Note to US readers: first class postage to Canada is $0.60 for the first ounce.]

Running a convention? If your convention has a telephone number, fax number, email address, or web page URL, please let us know so that we can publish this information. We must have your information in hand SIX months before the date of your convention. ■

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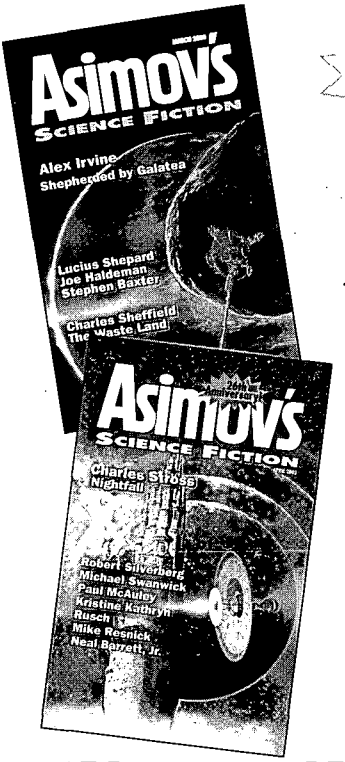

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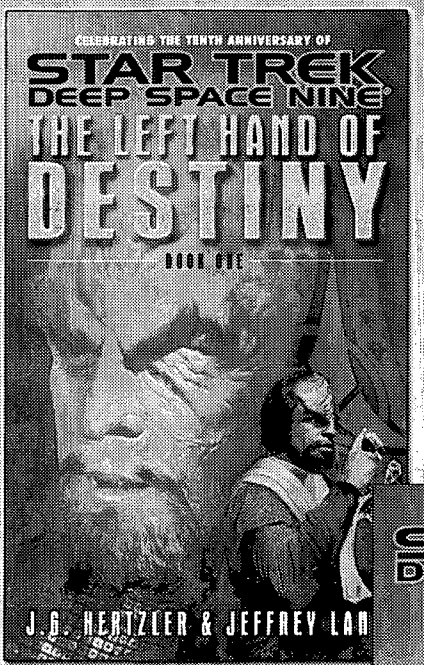

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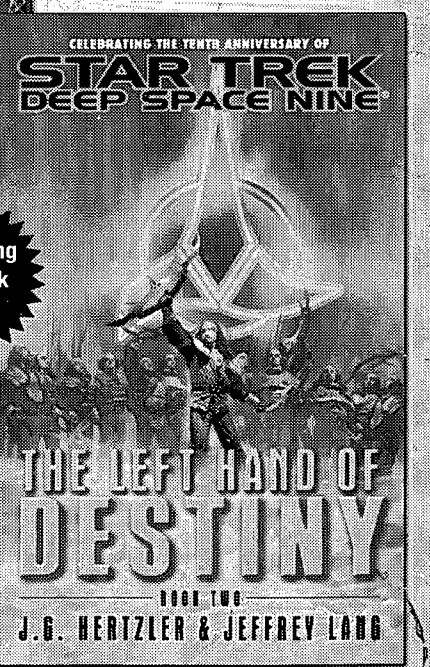

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